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AIR POLLUTION ABSTRACTS

Vol. 2, No. 5

May 1971

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Personal authors (maximum of five per document) are arranged alphabetically. The names are presented last name first. The title of the document is indented below the author's name; when the author was the first author of a title, it is designated by an asterisk. The Abstract Number follows on the next line.

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INTRODUCTION

This periodical is published to inform personnel of the Environmental Protection Agency's Office of Air Programs (OAP), and others, of technical literature recently accessioned by the Air Pollution Technical Information Center (APTIC). For each accession, its Abstract Number, APTIC accession number, bibliographic citation, and abstract are given.

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As another service, abstracts of all literature in APTIC (not just in a single issue of this periodical) on any subject related to air pollution will be provided free of charge upon request. APTIC can search information more recent than that in the current issue of this periodical because of the lapse of time entailed by editorial, make-up, and printing work. More than 1400 subject index terms are available for such searching--more than those included in the subject index in each issue.

SUBJECT FIELDS AND SCOPE NOTES

1. EMISSION SOURCES

Information pertaining to an industry, process, or material associated with air pollution. Documents in this category are concerned primarily with characteristics of a specific class of emission sources including types, rates, industries; secondary coverage may include effects, control methods, etc.

2. CONTROL METHODS

Includes equipment and both specific source control and general abatement efforts. Included are documents describing the operating principles, design, operation, efficiency, etc., of equipment and methods of removing pollutants. The scope of the document can vary from a device for a specific source to an approach applicable to an entire industry—e.g., automobiles.

3. MEASUREMENT METHODS

Includes equipment as well as methods. Confined to development, testing and evaluation of pollutant determination methods (sampling, analytical, monitoring) and equipment, as such. Data obtained by use of methods in specific applications are placed in the applicable subject categories.

4. AIR QUALITY MEASUREMENTS

Pollution measurements in the ambient air, generally related to specific geographical locations, such as area surveys. Also includes general reviews of area situations and emission source inventories.

5. ATMOSPHERIC INTERACTION

All chemical and physical phenomena occurring in the atmosphere. Included is material on dispersion, air pollution forecasts, meteorological effects, topographical effects, photochemical reactions in the atmosphere, etc. Laboratory studies of photochemical reactions are assigned to Basic Science and Technology.

6. BASIC SCIENCE AND TECHNOLOGY

General discussions or data compilations for the basic physical and chemical properties of pollutants. Theoretical and laboratory studies on related chemical and biological reactions and mechanisms. Mass transfer and other basic knowledge related to process engineering applications in emission control or abatement. Excludes photochemical studies in the atmosphere and biochemical studies related to effects of air pollution.

7. EFFECTS—HUMAN HEALTH

Covers medical and epidemiological studies; biological effects other than those on plants and livestock produced by air pollutants; laboratory animal experiments.

8. EFFECTS—PLANTS AND LIVESTOCK

Effects on vegetation—crops, trees, other plants—and on livestock as distinguished from laboratory experimental animals.

9. EFFECTS—MATERIALS

Deterioration, corrosion, etc., of physical materials, buildings, and structures.

10. ECONOMIC ASPECTS

Economic implications of air pollution and its control, e.g., economic losses from pollution damage, and costs of control programs or equipment in general.

11. STANDARDS AND CRITERIA

Recommended or adopted guides, criteria and standards for allowable emission limits or pollutant concentrations, air quality, equipment characteristics, and fuels.

12. LEGAL AND ADMINISTRATIVE

Legal aspects include legislation, ordinances, rules, litigation, hearings, decisions, etc. Administration covers administrative and miscellaneous information concerning control agencies and control and research programs. Typical topics are personnel, budgets, contractual activities and program descriptions.

13. SOCIAL ASPECTS

Sociological and psychological aspects such as social attitudes, public opinion studies, public relations, and public information.

14. GENERAL AND MISCELLANEOUS

Reviews of general problems, trends and background. Documents not assignable to other categories.

ABSTRACT BULLETIN

EMISSION SOURCES

10001

APTIC NO. 21100

Finkelstein, Harold

PRELIMINARY AIR POLLUTION SURVEY OF PESTICIDES. A LITERATURE REVIEW.

Litton Systems, Inc., Silver Spring, Md., Environmental Systems Div., Contract PH 22-68-25, NAPCA Pub. APTD 69-44, 169p., Oct. 1969. 115 refs.

CFSTI: PB 188091

The effects, sources, abatement, economics, and methods of analysis of pesticides are reviewed; appendices are provided of tabular material from selected references in addition to a glossary of names and uses of pesticides. The organophosphates are generally the most toxic while the chlorinated hydrocarbons present the greatest residue problem resulting in residue levels of DDT, particularly in human and animal fat tissue, in all parts of the world. At present, there is no medical evidence that the storage levels found in humans can produce chronic adverse health effects. Agriculture uses the most pesticides in the country, and the primary atmospheric contamination results from drift during the application process. Pesticides can volatilize into the air from soil, water, and treated surfaces, and pesticides containing dust from the soil can enter the ambient air and be transported for considerable distances before falling back to earth. Pesticides have been detected in the ambient air of the locales where they are used, as well as in urban and rural areas. Control methods used by the chemical industry in general are used in pesticide production facilities, while methods are under development to control pesticide drift during application, including use of micrometeorological data. In recent years, significant advances have been made in instrumentation for detection and analysis of low concentrations, usually by some form of chromatography. (Author abstract modified)

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APTIC NO. 21109

Schroeder, Henry A.

AIRBORNE METALS.

Sci. Citizen, 10(3):83-88, April 1968. 14 refs.

The frequency of cadmium, lead, and tin in the lungs of people from every country but Africa suggests industrial contamination as the source; lead and cadmium are among the elements known to shorten the life-span of mice and rats. Lead poisoning in human beings is a long-recognized problem, and cadmium has been linked to at least one chronic disease of human beings, high blood pressure. It is likely that cadmium enters the air as a by-product of industrial processing of zinc, and the principle source of airborne lead is undoubtedly tetraethyl lead, an anti-knock agent added to gasoline since 1924. Although average lead concentrations in the air are not considered high, varying from 0.2 micrograms per cubic meter on the Great Plains and Rocky Mountain areas to 0.7 micrograms per cubic meter in New England and the Pacific Coastal states, concentrations of six micrograms per cu m, and in ex-

treme cases seventeen to forty-five micrograms or more, have been measured in cities, especially on traffic crowded streets or highways.

10003

APTIC NO. 21429

Ohme, W. and Weskamp

REDUCTION OF EMISSIONS IN COKING PLANTS.

(Emissionsverminderung in Kokereianlagen). Text in German. VDI (Ver. Deut. Ingr.) Ber., no. 149:243-251, 1970. 11 refs.

The sulfur containing waste gases developing in coking plants are usually drawn off at the point of origin so that none of these gases can escape into the atmosphere. Certain amounts of sulfur dioxide and sulfur trioxide do escape, however, at the sulfuric acid production stage. Treatment of hydrogen sulfide containing gases is exclusively limited to wet catalytic methods. The SO₃ emission in new plants may not exceed 2 kg/ton of sulfuric acid. In the coke sifting and pulverization station of coking plants, dust is produced. The dust-laden air is usually drawn off and cleaned in cyclones and scrubbers. Dust emission by coking plants has been limited to 150 mg/cu m. Coke particles are carried along by the fumes developing at the quenching process of glowing coke. Injection of water into these fumes reduces the particulate matter by one third. More recently, baffles installed in the quenching towers are used for retaining these particles. The gases developing at the charging process are drawn off and cleaned in a subsequent scrubber. Discharge of the coke from the coke oven causes the highest emissions. Two separate wet collectors are used for collecting the dust from discharging of the coke from the chamber and for collecting the dusts from the dust fan above the quenching cart. The collectors are installed on the coke mass cart. Developmental work is still in process to further improve this cleaning process.

10004

APTIC NO. 21579

Dimentberg, M.

LNG VIA PIPELINE? Cryogenic Eng. News, vol. 3:34-44, March 1968.

The transmission of liquefied natural gas by pipeline is discussed, and the vapor phase natural gas pipeline is compared with a cryogenic LNG pipeline. When dealing with pipelines the important considerations are fluid friction and horsepower required. In both these items, LNG transmission is more advantageous than vapor phase transmission. To liquefy the natural gas and maintain it in the liquid phase requires a considerable expenditure for insulation and refrigeration stations along the length of the pipeline. The independent variables involved in pipeline design for vapor phase and liquid phase transmission are presented in tabular form. Feasibility studies were made of 24 basic LNG pipeline designs and compared to eight vapor phase cases. Cost estimates were carried out only to the point of establishing capital costs, which are presented graphically for polystyrene and multiple layer insulation. At a throughput rate of 40

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MMFC/hour, for example, the capital cost of a 1000 mile LNG pipeline using polystyrene foam is \$5300/MCF per hour while that of a pipeline using multiple layer insulation is estimated to be \$4900/MCF per hour. The advantage for multiple layer insulation decreases at the higher throughputs due to the fact that heat infiltration becomes of lesser importance.

10005

APTIC NO. 22246

Perterra, Jose M.

THE THREAT POSED BY DUST AND INDUSTRIAL GASES EMITTED BY CENTRAL HEATING PLANTS AND OTHER AIR POLLUTION SOURCES.

(*Peligrosidad de los polvos y gases industriales, emitidos por las centrales termicas y otras fuentes de contaminacion del aire*). Text in Spanish. *Quim. e Ind. (Bilbao)*, 14(6):195-206, Nov.-Dec. 1967. 21 refs.

Summarized and discussed are the dangers to human lungs from the particulate content of industrial emissions, as well as calculation of chimney height, use of purification equipment, and the harmful effects of gaseous pollutants (carbon dioxide, carbon monoxide, and sulfur dioxide). A study by a local agency in Oviedo, Spain, of the atmospheric dust content in the immediate vicinity of a large central heating plant using low quality coal at the rate of 1200 tons per day, showed an output of 1200 dust particles per cu cm of air, 170 of which were of a diameter smaller than 7 microns. The Spanish city of Aviles formerly received 350 tons of fine coal dust from the central heating plant of ENSIDESA. After reports were received of high incidence of lung diseases and lung cancer, electrostatic filters were installed, 99% effective, which considerably alleviated the health problems in that city. There is still much public apathy concerning air pollution in Spain.

10006

APTIC NO. 27696

Starkman, E. S., R. F. Sawyer, and R. C. Carr

THE INFLUENCE OF FUEL COMPOSITION ON EMISSIONS OF CARBON MONOXIDE AND OXIDES OF NITROGEN.

Preprint, *Society of Automotive Engineers, Inc., New York*, 28p., 1970. 23 refs. (Presented at the *Society of Automotive Engineers Mid-Year Meeting, Detroit, Mich., May 18-22, 1970*.)

Theoretical and experimental investigations were carried out to determine the effect of fuel composition on exhaust emission levels of carbon monoxide and nitric oxide from a reciprocating spark ignition engine. Fuels considered in the investigation were representative of the aromatic, paraffin, cycloparaffin, and olefin families. Results show that both energy content and hydrogen-to-carbon ratio of the fuel are instrumental in predicting exhaust concentrations of carbon monoxide and nitric oxide. A progressive change from paraffinicity to aromaticity is accompanied by an increase in nitric oxide and, to a lesser extent, an increase in carbon monoxide exhaust concentrations. (Author abstract modified)

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APTIC NO. 27714

Eyzat, P. and J. C. Guibet

THEORETICAL AND EXPERIMENTAL STUDY OF THE FORMATION OF NITROGEN OXIDES IN INTERNAL COMBUSTION MOTORS.

(*Etude theorique et experimentale de la formation des oxydes d'azote dans les moteurs a combustion interne*). Text in French. *Rev. Ass. Fr. Tech. Petrole*, no. 193:19-39, Jan./Feb. 1969. 12 refs.

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The thermodynamic conditions prevailing during combustion in a motor are specified, and the kinetic mechanism of nitric oxide formation is examined. A method is proposed on this basis that would permit calculation of nitric oxide emission on the basis of combustion-cycle data. A computer can be programmed to simulate operating conditions on the theoretical plane, as an aid in determining the best procedures for reducing nitric oxide emission while maintaining high standards of motor performance. A pressure-time graph was used to determine the thermodynamic conditions in each of the various time zones preceding combustion. From this, the speed of reaction and the instantaneous concentration of NO were calculated for the entire period of combustion. The NO concentrations calculated by this means agreed well with the experimentally determined concentrations. One procedure examined in the light of this theoretical research promised a reduction of NO emissions amounting to about 50%, without detracting in any way from motor performance.

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APTIC NO. 27738

Thomson, John C.

NAPCA FINDINGS ON GASEOUS FUELS.

Preprint, *National Air Pollution Control Administration, Ypsilanti, Mich., Div. of Motor Vehicle Research and Development*, 11p., 1970. (Presented at the *LP-Gas Engine Fuel Symposium, Detroit, Mich., Oct. 21, 1970*.)

The results of emission tests performed on a number of liquefied propane gas (LPG) powered vehicles are presented. The vehicles were not equipped with any emission control devices. Pollutants measured include hydrocarbons, carbon monoxide, and nitrogen dioxide. The use of gaseous fuels to reduce emissions would appear to be one solution to the complex problem of automotive air pollution if the supply can meet the usage requirements. Considerable reductions in emissions are possible on present vehicles when converting to gaseous fuels although optimizing for low emissions may be more difficult. When vehicles capable of meeting the 1975 standards are produced by the automotive industry, more extensive modifications may be required by gaseous fuel conversion manufacturers in order to show any reduction in exhaust emissions for other than carbon monoxide. There are also some inherent safety problems in handling gaseous fuels that are significantly different from those found using gasoline. The use of LPG would be even more hazardous unless a suitable odorant can be found. (Author summary modified)

10009

APTIC NO. 27799

Ishibashi, Kazuji, Yoshio Noda, Katsutoshi Yamada, and Tomoo Hamada

STUDY OF GENERATION OF SOOTY SMOKE BY COMBUSTIBLES-ON GENERATION OF SOOT BY SOLID FUEL.

(*Kanenbusshitsu no baien hasseisei ni kansuru kenkyu-Kotainenryo no baien hasseisei ni tsuite*). Text in Japanese. *Sangyo Kogai (Ind. Public Nuisance)*, 7(2):22-29, Feb. 1971. 9 refs.

Samples of coal and carbonized coal were studied for the quantity of smoke and soot generated by their combustion, at 300-500 C, on a fire grate. The quantity of smoke was examined in relation to the volatile content of the samples, the calorific value of the volatile content, and the quantity of volatilized residue. Except for two samples of carbonized coal, the quantity of smoke generated by combustion increased linearly for all samples with a volatile content above 25%. A similar trend was noted with regard to the quantity of volatil-

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ized residue. Application of the least squares method to the relationship between the quantity of smoke, amount of fuel volatilized, and volatilized residue also indicated a linear relationship.

10010

APTIC NO. 27803

Croke, Kevin G. and Edward J. Croke

THE INFLUENCE OF NATURAL GAS AVAILABILITY ON THE FEASIBILITY OF AIR POLLUTION EPISODE CONTROL.

Preprint, *Air Pollution Control Assoc., Pittsburgh, Pa., 22p., 1970. 2 refs. (Presented at the Air Pollution Control Association, Annual Meeting, 63rd, St. Louis, Mo., June 14-18, 1970, Paper 70-142.)*

To determine the amount of natural gas available for use in air pollution episodes, a study was made of the total natural gas demand, supply, and allocation procedures in Chicago. A two-year inventory of meteorological air quality data was then analyzed to determine the meteorological conditions, particularly temperature, associated with air pollution episodes. The results of this analysis were related to the supply and demand structure, and conclusions drawn concerning the steps that must be taken to develop effective fuel-switching control techniques. Three distinct temperature regions were found to require consideration. Above 40 F, the reorganization of the gas rate structure would be effective in reallocating natural gas for emergency control purposes. Below 25 F, industrial fuel switching does not seem appropriate because of the dominant effects of space heating emissions. In the 25-40 F range, where both space heating and industrial emissions play a significant part, effective techniques would necessitate the negotiation of an emergency low-temperature gas rate contract. The difficulty with such an air pollution contract is noted and two possible solutions are proposed.

10011

APTIC NO. 27821

Kaplan, Lawrence M. and Arnold Risman

FIELD EVALUATION OF ON-SITE INCINERATION AND WASTE COMPACTION PROCESSES.

Preprint, *Air Pollution Control Assoc., Pittsburgh, Pa., 37p., 1970. 3 refs. (Presented at the Air Pollution Control Association Annual Meeting, 63rd, St. Louis, Mo., June 14-18, 1970, Paper 70-52.)*

Several years ago, New York City established minimum requirements for the upgrading of existing on-site incinerators, which had been a significant source of particulate and smoke emissions. Subsequent source sampling revealed that no upgraded apartment house incinerator complied with particulate emission limits. Most of the incinerators tested were often misused or abused, either intentionally or through ignorance by improper maintenance and operation; furnace temperatures never reached the specified 14-1600 F range, and the smell of burnt garbage was generally noticeable in apartment house halls. Compactors are now being installed on new constructions and as an alternative to upgrading on-site incinerators. If these are going to alleviate the air pollution problem and the solid-waste disposal problem, they should be designed to compact refuse to a density of 1800 lbs per cu yard. Present indications are that compactors are being installed with as little forethought as incinerators have been in the past.

10014

APTIC NO. 27834

10012

Larson, E. C. and B. A. Nelson

THE GRAPHIC ARTS AND AIR CONSERVATION. PART 2.

Graphic Arts Mon., 39(11):64-70, Nov. 1967.

Both Los Angeles and San Francisco have enacted smog legislation restricting the emission of solvent organic vapors. At present, the legislation strikes hardest at the rotogravure industry because it uses the largest quantities of nonexempt solvents. Many solvents employed for the various types of gravure inks will require reformulation to reduce their aromatic content to acceptable limits. Ways in which this can be done while still providing adequate solvency include the use of naphthenes and oxygenated compounds such as alcohols, esters, glycol ethers, nitroparaffins, non-branched ketones, and some chlorinated hydrocarbons. Potential toluene and xylene substitutes are noted, as are substitutes for branched methyl isobutyl ketone.

10013

APTIC NO. 27858

Kohayagawa, Takeshi

PROBLEM OF POLLUTION DUE TO AUTOMOBILE EXHAUST GAS.

(Jidosha haishutsu gasu kōgai no mondai). Text in Japanese. Nippon Kikai Gakkai Shi (J. Japan Soc. Mech. Engrs. (Tokyo), 74(626):217-227, March 1971. 59 refs.

The extent to which lead in gasoline must be reduced is still an open question since leadless gasoline is likely to cause valve recession in existing automobiles and thus contribute to air pollution. Moreover, lead-free gasoline will have a low octane number unless aromatic hydrocarbons are added, and these cause photochemical smog. If the octane number is kept low, air pollution will be enhanced. The photochemical smog characteristic of Tokyo is unique in that the presence of peroxyacyl nitrates has not been detected nor ozone clearly identified. In Japan, 1973 and 1975 are target years for the reduction of air pollution. Problem area in controlling automotive emissions include methods for testing hydrocarbon activity, vapor loss, nitrogen oxides, airborne particulates, odors, and diesel smoke. To achieve emission reductions from 2-cycle and 4-cycle engines by the target years, studies are being conducted on improvements of engine factors, catalytic oxidation, secondary combustion, and improved fuels. In the case of 4-cycle engines, air-to-fuel ratios and improvements in ignition are also under investigation.

10014

APTIC NO. 27877

Tabak, Fernando

RECUPERATIVE FORMS OF DIRECT THERMAL INCINERATOR.

(Universal Oil Products Co., Des Plaines, Ill.) U. S. Pat. 3,549,333. 5p., Dec. 22, 1970. 7 refs. (Appl. July 23, 1968, 4 claims).

Despite improved burner design and provision for some measure of heat exchange, most modern incinerators still fail to make use of recuperative designs and to obtain economical, high-efficiency operation. The present invention provides a recuperative form of direct flame incinerator in which 100% secondary air for burner operation is obtained from the waste gas stream itself. The incinerator achieves efficient mixing of the gas stream with burner gases by means of a gas inlet plenum section which fully surrounds an axially positioned burner. The internally located combustion section of the unit is encompassed by an elongated annular heat exchange section

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which in turn is provided with multiple tubes. These tubes provide a passageway for hot combustion gases and separated adjacent passageway for the incoming gas stream. The passageways are in heat exchange relationship with one another, thus giving a highly efficient recuperative heat transfer to the incoming gas stream and a uniform full 360 deg annular flow to the plenum section. (Author abstract modified)

10015

APTIC NO. 27879

Shirasawa, Tadao

ON SMOKE PREVENTION AND HEAT CONTROL.

(*Baiken boshi to netsu kanri ni tsuite*). Text in Japanese. Preprint, Society of Electro-chemistry, Tokyo (Japan), K2rnto Div., 16p., 1971. (Presented at the Seminar on Air Pollution, Tokyo, Japan, Feb. 3-4, 1971, Paper 4.)

Major causes of air pollution are the reliance of industry on fuels such as petroleum and coal for energy sources and the utilization of these fuels for domestic heating. The problem of air pollution from fuel combustion is particularly difficult in Japan, where most fuel is imported and, therefore, comparatively expensive. For example, fuel amounts to 2.5% of total production costs vs. 0.97% in the U. S. Of the pollutants discharged with combustion gases, only dust particles and sulfur dioxide are covered by regulations. Smokeless, ashless, and low-sulfur fuel or, once economic and safety problems have been resolved, liquid petroleum gas represent one approach to preventing air pollution. A new smokeless fuel similar to coalite promises to control pollution from domestic heaters, but the fuel is expected to cost 25% more than existing fuels. Another approach to pollution control is the develop an optimum fuel combustion system. Systems under study include low-oxygen combustion and the premix flame (i.e., air premixed with fuel before combustion: the latter generates little soot but gives much less radiation heat than the soot-producing diffusion flame. The fact that radiation heat is needed for high-generating efficiency complicates the problem of preventing air pollution.

10016

APTIC NO. 27951

McKay, William H.

SMOG CONTROL DEVICE.

(Assignee not given.) U. S. Pat. 3,548,591. 3p., Dec. 22, 1970. 9 refs. (Appl. Sept. 11, 1968, 2 claims).

A device for removing a large percentage of unburned compounds from internal combustion engine exhaust gas comprises a washer-filter which collects larger particles and droplets and a second stage filter, preferably of charcoal particles, for further purification of the gases. Both filters are contained in an elongated housing in the engine exhaust line, the washer filter extending across the interior of the housing. This filter is in the form of manifolded stacked strips of woven or felted fibrous material. The filter of finely divided charcoal transversely fills a portion of the housing between the first filter and the housing outlet. The exhaust gases are driven through the housing and filters by a pump controlled to respond to pressure conditions in the engine exhaust line.

CONTROL METHODS

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APTIC NO. 20381

Juengten, H.

TECHNICAL EVALUATION OF THE REPORT BY THE SCIENTIFIC RESEARCH INSTRUMENTS CORPORA-

AIR POLLUTION ABSTRACTS, MAY 1971

TION, BALTIMORE OF SEPTEMBER 16, 1968; BASIC STUDIES ON SULFUR CONTROL BY MEANS OF COAL GASIFICATION.

(*Gutachten zum bericht der Scientific Research Instruments Corporation, Baltimore vom 16 September 1968: Basic Studies on Sulfur Control by Means of Coal Gasification*). Preprint, Bergbau - Forschung G. m. b. H., Essen-Kray, Germany, 4p., March 31, 1969. Translated from German. Franklin Inst. Research Labs., Philadelphia, Pa., Science Info. Services, 9p., Sept. 19, 1969.

The technique and results of an experimental coal gasification process are evaluated. Several modified equations are recommended for computing back reactions: these suggest that a limitation to a differential reactor or to a solid bed, in which the concentration of the reacting gas remains constant over the entire bed length, is useful. In interpreting measured results of the gasification process, the following reactions are considered significant: $\text{FeS}_2 + \text{H}_2$ in equilibrium with $\text{Fe} + \text{H}_2\text{S}$ at 600-800 deg and the reaction of heterocyclically bound organic sulfur at 600 deg and higher. Further analysis is suggested to determine whether the chemical reaction or the diffusion decides the speed of the above reactions. It is also proposed that CaO dolomitic lime and manganese oxide be considered as acceptors for the process, with reference made to U. S. patents covering these acceptors.

10018

APTIC NO. 21032

Bapsieres, P.

INDUSTRIAL METHODS OF DESULPHURIZING SMOKE.

(*Recuperation du soufre a partir d'effluents gazeux sulfures humides*). Text in French. Pollut. Atmos. (Paris), no. 45:1-15, Jan.-March 1970.

The industrial development of a country raises disturbing air pollution problems caused by the discharge to the atmosphere of such agents as sulfur compounds, fluoridized by-products, unburnt substances, nitrous vapors, and powder particles. Research carried out by the Societe Nationale des Petroles d'Aquitaine led to the development of a process which removes about 90% of sulfur dioxide from flue gas while producing 240 tons/day of sulfuric acid. The process is one of wet catalytic oxidation and involves the incineration to sulfur dioxide of hydrogen sulfide contained in residual gas leaving a Claus converter, the conversion of sulfur dioxide to sulfur trioxide on a solid catalyst in a mobile bed, the absorption of sulfur trioxide in the acid, and the concentration of the acid by gas-liquid contact, which is effected on a bed of Raschig rings.

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APTIC NO. 21048

Hardison, L. C.

TECHNIQUES FOR CONTROLLING THE OXIDES OF NITROGEN.

J. Air Pollution Control Assoc., 20(6):377-382, June 1970. 10 refs.

There are several systems in wide use for controlling nitrogen oxides from specific chemical sources. These are limited to nitric acid production and processes using nitric acid as a reagent. Most modern plants employ a catalytic reduction technique to reduce the concentrations of oxides, reduce NO_2 to NO , and heat the recovery stream for power recovery. This process requires a substantial fuel input, and allows significant emissions of colorless NO . This emission can be controlled only by increasing the quantity of catalyst and the amount of fuel by a factor of two over the conventional partial reduction

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technique. The conventional catalytic system has several design criteria: color freedom (NO₂ below the visible threshold); conversion of fuel high enough for economical operation; and sufficient temperature rise to secure design conditions at the inlet of the power recovery turbine. Each of these criteria is discussed in detail. In some areas, a two-stage system is required to remove all the oxygen from the stream to secure catalytic reduction of all the nitrogen oxides to nitrogen. The reduction of concentrated nitrogen oxides streams is also discussed.

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APTIC NO. 21218

Frankenberg, Theodore T.

AIR POLLUTION FROM POWER PLANTS AND ITS CONTROL.

Combustion, 34(8):28-33, Feb. 1963. (Presented at the National Conference on Air Pollution, Washington D. C., Dec. 10-12, 1962, Paper B-4.)

The progress in the control of air pollution from power plants during the period 1958-1962 is reviewed. Two continuing problems are identified as the economic removal of sulfur from coal and sulfur dioxide from stack gas and the economic control of nitrogen oxides. Major emphasis of present and future control efforts is on the use and design of high stacks. While the high concrete stack accomplishes its functions, sulfate attack on the concrete has resulted in some of the stacks built since 1954. Principle new problems facing the industry are identified as the shift to larger individual generating units and the installation of greater numbers of these larger units at a single site. In prepared discussion, the responsibility of the Bureau of Mines to develop the tools for the control of sulfur and nitrogen oxides is brought out, and its efforts in that direction specified. Since, without exception, all costs of air pollution control are reflected in the consumer's bill for service, the responsibility of both the industry and those who would promote arbitrary regulation to consider the value to the community of each control is emphasized.

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APTIC NO. 21291

Seidl, Walter

DESULFURIZATION OF WASTE GASES AND FUEL.

(*Entschwefelung von abgasen und Brennstoffen*). Text in German. *Brennstoff-Waerme- Kraft*, 22(4):174-180, April 1970. 220 refs.

Daily average sulfur dioxide concentrations of more than 300 micrograms/cu m (0.11 ppm) for three or four days may affect human health. The same is true for long-term exposure to annual average concentrations above 0.04 ppm. Material begins to deteriorate at 0.12 ppm annual average. Plant damage appears at 0.03 ppm annual average. The Continuous Air Monitoring Project in the U. S. yielded annual average concentrations of 0.01 ppm for San Francisco and 0.18 ppm for Chicago. In 1966, 28.6 million tons of SO₂ were emitted in the U. S. A list of existing desulfurization methods for waste gases is given, beginning with those used in the U. S. The most important processes enumerated are as follows: the dry lime/dolomite process by TVA; the C-E process; the alkalized alumina process; the Monsanto-Penelec process; and the Beckwell process. For the Federal Republic of Germany, the following processes are used: the Wikkert process; Bischoff-, Reinluft-, and Grillo-AGS-processes; and the sulfacid process. For Japan, the Hitachi, Mitsubishi, and Kiyoura processes are named. Numerous bibliographic references are given for each process. The Electricite de France scrubs flue gases in NH₄OH-solution. In Austria, the Stickstoffwerke Linz absorb

SO₂ in ammonium sulfite-bisulfite-solution. All fuel desulfurization processes are presented in a similar way. No description of any of the processes is given. Gasification of coal is specifically mentioned. Plants for the removal of sulfur from mineral oil are being installed on the East Coast of the U. S. they will have capacities of 5 million tons/year and will reduce the sulfur content to less than 1%. The Consolidated Edison Co. switched to oil with less than 1% S as fuel and to natural gas.

10022

APTIC NO. 21312

Silex, Klaus

PRESENT AND FUTURE DUST REMOVAL IN FOUNDRIES.

(*Stand und Perspektive der Staubbekämpfung im Industriezweig Giessereien*). Text in German. *Giessereitechnik*, 16(3):80-83, 1970. 6 refs. (Presented at the second meeting 'Combating of Dust', Leipzig, Oct. 9 and 10, 1969.)

At present, the dust developing at the various stations in foundries in East Germany is drawn off individually by fans or blowers. With progressing automatization, it is foreseen that central exhaust systems will be installed. Legal regulations determine that the sand be pneumatically transported, the sand treatment station be housed in a separate building, or that an underpressure be maintained if this is not feasible. The use of pressurized air for cleaning the molds is forbidden. The dust must be drawn off by exhaust fans. In the past few years, wet collectors have been frequently used for dust removal. Critical analysis, however, shows that in some cases (e.g. at large air quantities) dry collectors are preferred. The selection of the dust removal system suiting individual conditions is urged. It is predicted that electrostatic precipitators will gain greater importance in foundries because of the high collection efficiency for small particles. They will not become the universally used collector for foundries, however, because of the large space requirement and the high investment cost.

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APTIC NO. 21408

Tomany, James P.

A GUIDE TO THE SELECTION OF AIR POLLUTION CONTROL EQUIPMENT.

UOP Air Correction Div., Darien, Conn., 31p., 1969 (?).

Equipment made for the collection of air pollutants is described. Three equipment types available for the control of gases or vapors are combustion, absorption, and adsorption devices. Four major types of equipment utilized for the collection of particulate matter are mechanical collectors, electrostatic precipitators, fabric filters, and wet scrubbers. Two combustion systems, thermal and catalytic, are described and a brief cost comparison of the two is given. Some of the technical limitations of the adsorption process are listed. In the collection of particulate pollutants, process considerations and equipment limitations must be considered in selection of equipment. Below 5 micron particle size, mechanical collectors lose much of their efficiency and other equipment should be considered. If product recovery is a requirement, dry collectors are preferred. If the gas stream is over 600 F, the fabric filter is eliminated as is, in most instances, the wet scrubber. Operating costs for all four types of particulate collectors are essentially power costs to overcome gas pressure drop through the collector. The electrostatic precipitator has an additional power cost to maintain an electrical field. Cost comparisons of the various collection systems are provided. Before any equipment item can be specified, a definition of the type of contaminant, concentration, and degree of control must be deter-

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mined. In the control of gaseous and vapor pollutants, a determination of the pollutants being emitted must be made. For any collection system from a gas stream, the gas temperature, moisture content, pollutant identification and concentration, and degree of control are required to be able to design an efficient system.

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APTIC NO. 21502

Grant, Eric P.

CALIFORNIA AIR POLLUTION CONTROLS IN TRANSITION.

CALDEA Calendar, 15(2):8,26, Jan. 1968.

Control systems have been on California automobiles since the introduction of the 1966 models, and they have reduced the total emissions from vehicles by near 70% for hydrocarbons and about 50% for carbon monoxide. Without vehicle controls, there would be 2 million gallons of hydrocarbons going into the California atmosphere each day. Enormous improvements in the quality of exhaust control equipment have been made since installation of the first systems, and quality audit programs have improved in which representative samples of engines sizes and transmissions are tested for pollutant emission levels. The Air Resources Board has been directed to divide the State into regional air basins, establish air quality standards for these basins, coordinate smog research and control programs, and administer Federal grants. Insofar as the auto emission control program is concerned, the ARB can be expected to direct itself to the following: the early institution of hydrocarbon emission standards in the area of 100 ppm; elimination of the averaging concept in favor of an absolute maximum allowable standard applicable to each and every California-registered automobile; increased rapport between the ARB, the California Highway Patrol, and the Department of Motor Vehicles in a resolution of enforcement problems; the abatement of nitrogen oxide emissions; and elimination of diesel smoke and odor.

10025

APTIC NO. 21578

Bertie, Elmer M.

NATURAL GAS PROCESSING. SAFER PROCESSING OF H₂S-BEARING GAS.

Hydrocarbon Process. Petrol. Refiner, 42(4):115-123, April 1963. 9 refs.

A guide to handling hydrogen sulfide, a toxic contaminant encountered more and more in the gas processing industry, is provided. To manage these gases safely, processors need to design air breathing systems, select and apply related breathing equipment, and provide rescue apparatus. Training and maintenance programs are also needed to ensure effective use of this equipment. Exposure to H₂S above 500 ppm can lead to unconsciousness and death. The victim's air passage should be opened by tilting the head back as far as it will go, to restore breathing employ artificial respiration, and, to restore circulation, a closed chest heart massage should be applied. Central, isolated, or portable air breathing systems can be used in a natural gas processing plant depending on the extent of area, the nature of the processes involved, and economic considerations. Air line and self-contained demand masks can be applied safely in all types of atmospheres injurious to the eyes or respiratory system. Mechanical, oxygen fed resuscitation equipment is a necessity where H₂S is processed. Detector and alarm systems for use in plants where H₂S is processed are also discussed.

AIR POLLUTION ABSTRACTS, MAY 1971

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APTIC NO. 22153

Chovin, Paul

ATMOSPHERIC POLLUTION AND AUTOMOBILES.

(Pollution atmosphérique et véhicules automobiles). Text in French. Pollut. Atmos. (Paris), vol. 12:43-56, May 1970.

Paris contains over one million automobiles at present, and atmospheric pollution from escaping gas is approaching dangerous levels. Aside from carbon dioxide gas and water vapor, carbon monoxide, and certain oxygenated derivatives of hydrocarbons, there exist also the hydrocarbons themselves. These compounds remain unburned and give off the black fumes which escape not only from diesel engines but also from automobile motors. For ten years the Central Laboratory of Police Headquarters in Paris has undertaken the measurement of vehicular pollution levels in order to better assess health hazards from emitted pollutants. As a result of numerous experiments, certain European automobiles already satisfy the requirements for decreased pollution levels, but the majority must still be perfected so as not to exceed the emission levels which have been established. One solution consists in injecting fresh air at the exhaust valves. Another advocates the complete halt of fuel injection into the automobile motor during deceleration phases. A solution found by engineers in Germany concerns 'electronic injection': an electronic calculator regulates the injection of fuel according to a number of fundamentals such as speed, acceleration, and power.

10027

APTIC NO. 22688

McChaskey, Sibley Byron

IMPROVEMENTS IN OR RELATING TO PROCESSES FOR THE RECOVERY OF SULPHUR FROM SULPHIDE ORES.

(Assignee not given.) Brit. Pat. 417,276. 8p., Oct. 2, 1934. (Appl. June 21, 1933, 8 claims).

A cyclic process for the recovery of elemental sulfur from sulfide ores is described. The ore is subjected to an oxidizing roast, while the sulfur dioxide concentration in the gases so obtained is controlled by introducing a mixture of air and a predetermined proportion of SO₂ into the furnace. Gases from the furnace are passed to a conversion chamber, supplied with a carbonaceous fuel, where the reduction of a portion of the SO₂ to sulfur occurs. Elemental sulfur is removed from the gases leaving the conversion chamber by condensation. The gases are then treated to recover the remaining SO₂, which is effected by absorbing the SO₂ from the gases with water and then expelling the dissolved SO₂ from the solution by intimate contact with air. This SO₂-air mixture is then passed to the roasting furnace. The flow rate of the SO₂-containing gas into the conversion chamber is regulated so as to avoid uneconomic fuel consumption and to obtain only a partial reduction of the SO₂. Gases supplied to the conversion chamber contain about 11-12% SO₂ and 6.7-5.4% oxygen.

10028

APTIC NO. 22940

Palen, A. G. Paul

BOLIDEN IMPROVES WORK AT RONNSKAR SMELTER.

Eng. Mining J., 139(9):54-55, 1938.

A flotation process for separating arsenopyrite and copper pyrite from barren pyrite was developed by a Swedish smelter, thus decreasing the tonnage of ore to be smelted and improving the metallurgical practice. The concentrator treats pyrite ore and siliceous ore derived from mineralized wall rock. The pyrite ore yields a smelting concentrate and a pyrite concen-

trate with about 5.5 sulfur and practically free from copper and precious metals. The siliceous ore gives a smelting concentrate and waste. The ore that goes directly to the smelter is now finer than before since it passes a screen with slots 7 times 12 mm as against 15 times 32 mm. This has greatly improved the reverberatory work, especially when running on a mixture of flotation concentrates of crushed ore. With the decreased amount of material to be treated (700 tons daily instead of 1000 tons), eight 7-m diameter roasting furnaces are sufficient. However, the smelter has introduced wet refining processes to recover arsenic and selenium. To protect forests against smoke damage, sulfur dioxide in roaster gases is catalytically reduced by a reducing gas to elemental sulfur.

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APTIC NO. 23189

Oparin, V. V.

PURIFICATION OF ATMOSPHERIC AIR OF CONTAMINANTS FROM INDUSTRIAL DISCHARGES.

In: *American Institute of Crop Ecology Survey of USSR Air Pollution Literature. Effects and Symptoms of Air Pollutants on Vegetation; Resistance and Susceptibility of Different Plant Species in Various Habitats, In Relation to Plant Utilization for Shelter Belts and as Biological Indicators.* M. Y. Nuttinson (ed.), vol. 2. Silver Spring, Md., American Institute of Crop Ecology, 1969, p. 1-5. (Also: *Akad. Nauk SSSR Ural. Filial. Komis. po Okhrane Prirody. Rastitel'nost' i promyshlennyye zagryazneniya. Okhrana prirody na Urale. V (Sverdlovsk), 1966, p. 7-10.*) Significant work on an overall solution to air pollution control in the Ural industrial areas was carried out by the Central Ural Sovnarkhoz. The basic steps towards sanitation of the surrounding air included the construction of new and the updating of existing purification installations, improvement of their utilization, organization of research programs, and utilization of valuable products in industrial discharges. Atmospheric purification in industrial areas is conducted by construction of dust catchers and gas utilization shops; change in technological processes; establishment of protective belts of verdant plantings around industrial plants; and the closing of certain industrial plants. Many industries are changing from coal to oil, which is expected to greatly reduce ash, dust, and smoke emissions.

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APTIC NO. 23251

SOVIET SCIENTISTS DISCUSS AIR POLLUTION.

NTO-SSSR, no. 12: 16-18, 1968. In: *Commentary in Soviet Periodicals on Environmental Pollution. Translated from Russian. Joint Publications Research Service, Washington, D.C., p. 30-36, April 1970.*

CFSTI: PB 190788

A discussion of air pollution in the Soviet Union is presented. Automobile emissions are not as serious a problem in Russia as they are in the United States, particularly California. Stack gases are being filtered to remove the particulates. Sulfur dioxide can be removed by desulfurization of fuel, by utilizing high chimneys, by replacing sulfur-containing fuel with natural gas, and by reacting the sulfur with other chemicals to capture it. Two methods of capturing the sulfur are the cyclical magnesite and the ammonium autoclave methods. A description of these methods is given, including their shortcomings. Filtering petroleum at the refinery and treating the resulting hydrogen sulfide by the Klaus method would be an expedient way to handle the problem. Catalytic oxidation methods for treating hydrogen sulfide are described. Hydrocarbons are generally controlled by either absorption or adsorption. Filtering of

waste gases and ventilation of large quantities of air are expensive processes. If they can be avoided by improving other operations, considerable economic savings will be realized.

10031

APTIC NO. 23271

Agren, Per

CONCERNING THE MANUFACTURE OF SULFUR FROM GASES CONTAINING SULFUR DIOXIDE.

(Om tillverkning av svavel av svaveldioxidhaltiga gaser). Text in Swedish. *Svensk Papperstid.* (Stockholm), vol. 39:470-482, 1936. (Presented to the Norsk Ingeniörförening, Oslo, Sweden, Oct. 16, 1936.)

Elemental sulfur is obtained in a variety of ways: by mining sulfur found in nature; by obtaining it directly from sulfide ores; by manufacturing it from gases containing sulfur dioxide such as reduction of roasting gases with charcoal or reducing gases, or concentration of the SO₂ component of the gas, followed by reduction (absorption in water under pressure, in an aqueous solution of aluminum sulfate, or in xylydine; other methods of concentration); manufacture from hydrogen sulfide (treatment with acid, sulfur dioxide, or sulfates); manufacture from sulfates; and recovery of sulfur from fossil fuels such as peat, lignite, and pit coal, especially in gas works, coke plants, and low-temperature carbonizing plants. The Bolidens Bruvaktiebolag of Sweden developed a method for manufacturing sulfur directly from gases containing sulfur dioxide. Their plant at Ronnskar produces 20,000-25,000 tons of pure, high quality sulfur per year. Imperial Chemical Industries Ltd. of England has a process for concentrating the SO₂ content of gases, from which concentrate liquid SO₂ or elemental sulfur is made. This process is used by the Outokumpu O/Y copper works at Ematra, Finland, with a capacity for producing 52 tons of liquid SO₂ per day. The methods worked out by these two companies, Swedish and British, are described in detail.

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APTIC NO. 25552

Lewis, Clifford J., Jean P. Champagne, Jean McPherson, and June Paramore

SULFUR EXTRACTION USING TRICHLOROETHYLENE IN PRESENCE OF LIMESTONE, TRONA, AND SODA ASH.

(Chapman, Wood and Griswold, Ltd., North Vancouver (British Columbia)) U. S. Pat. 3,535,089. 5p., Oct. 20, 1970. 11 refs. (Appl. Sept. 12, 1968, 7 claims).

An economical, technically feasible process and apparatus are described for the prevention of solvent loss in the extraction of high grade sulfur from elemental sulfur bearing material. This has been accomplished using a hydrocarbon solvent in conjunction with a substance which maintains the pH of the ore and the sulfur saturate solvent in the range of from about 3 to 8 during the solvent extraction operation. The hydrocarbon solvent may be trichloroethylene, although other chlorinated hydrocarbons and other solvents such as aromatic hydrocarbons and aliphatic hydrocarbons may be utilized. Such materials as limestone and trona reduced to a suitable fineness may be used to accomplish the desired pH. In addition, soda ash may be employed. The sulfur saturated solvent containing dissolved sulfur is separated from the residual feed and cooled to crystallize elemental sulfur. The crystallized sulfur is separated from the solvent, the residual solvent from the crystallized sulfur and from the gangue recycled; the cooled solvent which contains some crystallized sulfur is recycled to the contacting stage.

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APTIC NO. 27694

Squires, Arthur M. and Robert A. Graff

PANEL BED FILTERS FOR SIMULTANEOUS REMOVAL OF FLY ASH AND SULFUR DIOXIDE. III. REACTION OF SULFUR DIOXIDE WITH HALF-CALCINED DOLOMITE.

Preprint, Air Pollution Control Assoc., Pittsburgh, Pa., 23p., 1970. 7 refs. (Presented at the Air Pollution Control Association Annual Meeting, 63rd, St. Louis, June 14-18, 1970, Paper 70-30.)

Half-calcined dolomite is a candidate solid for use in panel bed filters which can simultaneously remove fly ash and sulfur dioxide from flue gas. Other candidates include a copper oxide absorbent, activated carbon, and alkalinized alumina. Preliminary experiments confirmed a previous finding which showed that good reactivity is obtained at about 600 C, making the technique usable in a boiler ahead of the economizer. The solid can be regenerated by reduction three absorptions with intermediate regeneration conducted on the same sample showed no significant loss of reactivity or capacity. A flowsheet example is presented for the cyclic use of half calcined dolomite in a process producing elemental sulfur for the market. (Author abstract modified)

10034

APTIC NO. 27703

Hyne, Allan

ELECTRIC CARS.

Clin. Toxicol., 2(3):329-334, Sept. 1969.

The limited range of the battery-powered electric car is noted to be the factor keeping it from competing with the modern gasoline engine. Storage battery improvements in the near future are unlikely to extend this range much over 250 miles. Eventually, when high-power fuel cells with efficiencies of 70-80% become available at reasonable costs, the electric car will come into its own. In the meantime, the hybrid electric car may be an acceptable solution to the smog problem. This car has the advantage of instant full power starts with the energy being supplied by batteries until a thermal-power generator warms up and takes over. One version of a hybrid car uses a Sterling engine to drive its generator. Efficiency of the engine is relatively high, yet the gas used to heat it is burned at atmospheric pressures and produces a very low level of pollutants.

10035

APTIC NO. 27704

Renner, Roy A.

THE STEAM CAR: ITS ROLE IN REDUCING AIR POLLUTION.

Clin. Toxicol. 2(3):335-343, Sept. 1969. 8 refs.

Prototypes of modern steam cars were tested and the cars were found to meet present criteria for performance, smoothness, and fuel economy. The cars can be driven at freeway speeds of 65-80 mph. Fuel consumption, at 12-20 miles/gallon, is nominal, and the only noise is a subdued rumble from the burner. Emissions of carbon monoxide, hydrocarbons, and nitrogen oxides from the steam cars were below the 1972 proposed California standards, and future improvements should reduce emissions even further. Based on these findings, the proposal is made that the automobile industry concentrate on making low-cost mass production of steam cars possible instead of continuing to apply add-on remedies to the present internal combustion engine.

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APTIC NO. 27705

Helfinstine, Roy J., Jack A. Simon, Neil F. Shimp, and M. E. Hopkins

SULFUR REDUCTION OF ILLINOIS COALS: WASHABILITY TESTS.

Illinois State Geol. Surv. Environ. Geol. Notes, no. 34, 12p., April 1970.

One obvious way to reduce the emission of sulfur dioxide from coal-burning equipment is to reduce the sulfur content of the coal to be the practical minimum. To determine what the practical minimum is for Illinois coals, the washability characteristics of 40 coal samples from 35 Illinois mines were studied. This was done by placing samples in solutions having suitable specific gravity and determining the percentage of the 'float' and 'sink' fractions. Chemical analyses, which determined percentages of ash, sulfate, sulfur, pyritic sulfur, organic sulfur, and total sulfur were made on all float fractions and on some sink fractions. Only five of the coals tested could be reduced to 0.50% sulfur with 80% recovery. Most of the Illinois coals appear to contain 3-5% sulfur. These coals will retain from 2.5 to 4% with 80% recovery.

10037

APTIC NO. 27715

Kochnev, K., M. Vasil'yev, and S. Filatov

NEUTRALIZATION OF EXHAUST GASES IN OPEN PIT MINES.

J. Amer. Assoc. Contam. Contr., 1964:16, 18-19, May 1964.

An apparatus is described for de-coloring and oxidizing the toxic components of exhaust gases from dump trucks used to transport loads from open pit mines. The device is based on catalytic afterburning, with the catalyst layer in a pseudo-liquefied (boiling) state. It includes a cycloning component for partial trapping of unignited fuel oil from the exhaust gases and for recovery of the heat generated during oxidation, and an injector type preheater which preheats the exhaust gas when its temperature drops below 300 C in order to achieve effective afterburning under all operating regimes. In the boiling layer, 3-4 mm ferromanganese particles were used, mixed with oxidized metallic copper particles of the same size; dunite, activated by a mixture of 25-30 mm nickel and copper oxide particles, was used in the static filter. The following average reduction of concentrations in the exhaust gases were obtained with the neutralizer: aldehydes, 95%; carbon monoxide, 80%; and nitrogen oxides, about 50%. The equipment is in mass production.

10038

APTIC NO. 27719

Hopper, W. C. and B. Rayzacher

THE IMPACT OF THE OIL INDUSTRY ON THE ENVIRONMENT, 2ND EDITION.

Stichting Concawe, The Hague (Netherlands), Rept. 4/70, 19p., March 1970. 12 refs.

The environmental impact of refining operations and oil products is assessed. While super tankers represent a very great potential for pollution, the industry is generally careful to minimize oil losses during transportation—both at sea and overland. The problem of odors can be reduced by good maintenance and should gradually diminish with the introduction of modern refining techniques and engineering innovation. Many refineries are reducing sulfur dioxide emissions by recovering sulfur from hydrogen-sulfide gas streams. The sulfur-free gas is used to recover butane or for reforming to domestic gas or for the production of liquefied petroleum gas. The problems of refinery water effluent and refinery noise are complex, the

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former sometimes calling for biological oxidation or cooling-water recycle systems and air cooling. Noise is difficult to mask since most refinery equipment, for safety reasons, is operated in the open air. New engineering solutions must be found. With respect to petroleum products, there is already a steady downward trend in the sulfur content of fuel oils. This is due to the increasing availability of low-sulfur crudes and gradual changes in the refining pattern in response to changing demands for products.

10039

APTIC NO. 27722

McNally Pittsburg Manufacturing Corp.

COAL CLEANING PLANT: PROTOTYPE PLANT DESIGN DRAWINGS.

Pittsburg Manufacturing Corp., NAPCA Contract PH 22-68-59, 20p., 1969.

NTIS: PB 196633

A flow diagram and 17 plant design drawings are compiled for a prototype plant processing a wide variety of coals to produce coals with acceptable sulfur contents. For a discussion of plant design and projected costs, see NTIS: PB 196631.

10040

APTIC NO. 27726

Squires, Arthur M., Robert A. Graff, and Melvyn Pell

DESULFURIZATION OF FUELS WITH CALCINED DOLOMITE. I. INTRODUCTION AND FIRST KINETIC RESULTS.

Preprint, American Inst. of Chemical Engineers, New York, 32p., 1969. 34 refs. (Presented at the American Institute of Chemical Engineers, Annual Meeting, 62nd, Washington, D. C., Nov. 16-20, 1969.)

Calcined dolomite is a candidate acceptor for hydrogen sulfide in processes to provide sulfur-free fuels for power station use. Preferably, the processes would be satellite to power generating apparatus, thereby affording a saving in both capital and operating costs, as well as recovering a sulfur byproduct. Gasification with air and carbonization or cracking are candidate steps for incorporation in such power satellite fuel treating processes, as they release sulfur in the form of H₂S, which both fully calcined and half calcined dolomite have the power to accept. An acceptor process also has the unique capability, when it includes a carbonization of cracking step, of supplying a portion of the treated fuel in the form of a low-sulfur coke. The conditions of temperature and pressure which pertain to the reaction of both forms of dolomite with hydrogen sulfide are discussed. To illustrate the technical possibilities of this process, a representative clean power system for treating coal is sketched. Kinetic data are given for the reaction between calcined dolomite and H₂S between 475 and 850 C. The activation energy is estimated to be about 30 kcal/g-mole K. (Author abstract modified)

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APTIC NO. 27727

Kovach, J. Louis and David G. Hannan

COMBINED DUST, AEROSOL AND VAPOR REMOVAL EFFICIENCY OF PACKED ACTIVATED CARBON BEDS.

Preprint, 14p. 1970. 9 refs. (Presented at the International Dust Conference, Bonn, West Germany, 1970.)

A combined filtration system is described which consists of a deep, packed bed of activated carbon followed by a bank of high efficiency particulate air filters. Conventional air cleaning systems have high cost/efficiency ratios due to the large amount of hardware required, as well as serious shortcomings

in the removal efficiency for submicroscopic particles and in their fragility. Design parameters were established for a boiling water nuclear reactor emergency standby gas filter system to remove particulate and gaseous fission products, particularly iodine species. The particulate filtration efficiency of packed carbon beds exhibited characteristics similar to the fibrous filters, i.e., an increase in efficiency with a decrease in granule size. Carbon, which was loaded with either fly ash or DOP aerosol, did not show a decrease in iodine vapor adsorption efficiency. When finer carbon particles are used, both the gaseous and particulate efficiency of the deep bed is higher than with coarse granules; consideration of the pressure drop and the wider distribution of decay heat within the adsorber favor the use of coarse grain beds. An additional advantage of the coarse grain beds in nuclear applications is the prevention of flooding the bed at high water droplet loadings. The shape of the aerosol removal curves indicates that different removal mechanisms dominate at different carrier gas velocities.

10042

APTIC NO. 27732

Vos, A. W. D. and J. Smarsh

AUTOMOTIVE COATINGS AND POLLUTION.

Preprint, Society of Automotive Engineers, Inc., New York, 4p., 1970. (Presented at the Society of Automotive Engineers, Mid-Year Meeting, Detroit, Mich., May 18-22, 1970, Paper 700466.)

Water and air pollution which result from the various processes in painting automotive sheet metal and bodies are reviewed: cleaning and phosphate coating; spray painting and treatment of spray paint sludge; electrocoating; paint 'curing' and 'baking'; wet sanding; paint stripping; and the use of sealers, deadeners, and adhesive applications. Regulations in effect in various communities affecting these processes are briefly described; these concern control of organic and particulate emissions, opacity and odor, and water treatment requirements. Current control measures being undertaken by the Ford Co. include incinerator installations to control oven emissions, undercoating, and use of electrostatic spray equipment. In addition, several promising materials are being evaluated, such as thermosetting and thermoplastic nonaqueous dispersion enamels, higher solids solution acrylic enamels, water-based enamels and primers, and powder coatings. Material and emission testing is conducted in the laboratory; in addition, tests are conducted at assembly plants to measure exhaust or stack emissions, particularly when new materials are used in production

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APTIC NO. 27734

Kipp, K. L., J. C. Ingamells, W. L. Richardson, and C. E. Davis

ABILITY OF GASOLINE ADDITIVES TO CLEAN ENGINES AND REDUCE EXHAUST EMISSIONS.

In: Air Pollution-1970, Part 4. 91st Congress, (Senate), Second Session on S. 3229, S. 3466, S. 3546, p. 1441-1462, 1970. 9 refs. (Hearings before the Subcommittee on Air and Water Pollution of the Committee on Public Works, March 26, April 1 (Los Angeles, April 17, May 27, 1970.) (Presented at the Society of Automotive Engineers, Mid-Year Meeting, May 18-22, 1970, Paper 700456.)

Carburetor detergents introduced in the early 1950's were capable of keeping carburetors clean and thus prevented engine malfunction caused by this source. However, these detergents generally would not keep pollution control valves (PCV) clean or prevent ring belt deposits. Moreover, they usually did a poor job of cleaning carburetors on vehicles used in severe

conditions and were ineffective in coping with increased carburetor deposits resulting from PCV systems. In contrast, new gasoline additives based on polybutane amines are able to keep carburetors clean under most conditions and to remove existing deposits. These additives also clean intake manifolds, intake ports, and PCV valves. In addition, they assist in keeping all rings free and clean and in reducing hydrocarbon and carbon monoxide levels in exhaust emissions.

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APTIC NO. 27736

Reed, Robert D.

EXPERIENCE AS A FACTOR IN STUDIES OF AIR POLLUTION.

American Inst. Chemical Engineers, New York, and American Society of Mechanical Engineers, New York, Proc. MECAR Symp. Design and Operation for Air Pollution Control, New York, 1968, p. 86-92. (Oct. 24.)

Differences between smoke and a plume of steam are discussed together with their respective origins. A stack plume which completely disappears within a short distance downwind is generally due to water vapor and not only harmless but actually beneficial. A plume that persists and has little tendency to disappear in downwind travel is due to particulate matter. Conditions under which submicron particles can be expected and requirements for their removal are summarized. Also discussed is the ability of extremely minute concentrations of certain substances to produce objectionable odors whose elimination will require a new study of what is necessary for truly complete combustion. With regard to smoke abatement, some success has been achieved with over-fire jets in coal burning installations. Flares for the smokeless burning of waste gases are less successful as well as a source of secondary pollutants. Designs of process installations in which fuels are to be burned either in furnaces or in flares must become aware that stack and flare heights should be based on air pollution factors, though some formulations under adoption by the states lead to unnecessarily high stacks and flares.

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APTIC NO. 27741

Kneese, Allen V.

POLLUTION AND A BETTER ENVIRONMENT.

Ariz. Law Rev., 10(1):10-18, Summer 1968, 2 refs. (Presented at the 33rd American Wildlife and Natural Resources Conference, Houston, Tex., March 13, 1968 and at the Bureau of National Affairs-Federal Bar Association Air and Water Pollution Control Briefing Conference, Washington, D. C., March 14, 1968.)

In the past, it was assumed that the pollution problem was solved when liquid or gaseous waste streams were treated, or solid wastes burned. In recent years, it has become apparent that air, water, and solid waste problems are closely interdependent and that their analysis and control is best viewed as a system problem relating to the whole process of residuals generation and control. The residuals problem is discussed in the context of the materials balance problem for the entire economy, i.e., goods whose material substances remains in existence and must either be reused or discharged to the ambient environment. Solid residuals, or for that matter those that remain in a liquid or gaseous state, do not necessarily have to be discharged to the environment. In many instances, it is possible to recycle them back into the productive system. The materials balance view underlines the fact that the total materials throughput necessary to maintain a given level of production and consumption decreases as the technical efficiency of recycle processes increase. In addition, the more ef-

ficient energy conversion processes become, the fewer waste products there will be for the environment to receive. A region that practices high-level recovery and recycle of waste materials and fostered low-residual production processes would discharge very little residual waste to any of the environmental media.

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APTIC NO. 27751

Cooper, Jonathan C. and Frank T. Cunniff

CONTROL OF SOLVENT EMISSIONS.

Proc. MECAR Symp., New Developments in Air Pollution Control, New York, 1967, p. 30-41. (Oct. 23.)

Surveys conducted in 1965 showed that about 550 tons of organic solvents were being vaporized into the Los Angeles atmosphere and 300 tons into the San Francisco atmosphere. In Los Angeles, the solvent emissions amounted to one-fifth of the organic emissions from all sources; in San Francisco, they amounted to 15% of the organic emissions from all sources. The approach taken by the two cities to control solvent emissions has been to divide organic solvents into two classes depending on the degree of their susceptibility to photochemical smog-forming reactions. Emissions of highly reactive solvents must be reduced by a minimum of 85% while less reactive solvents are exempted from most controls. The exempt solvents are almost invariably more expensive than the controlled solvents so their use raises operating costs. Moreover, even these solvents eventually may have to be controlled as the volume of air pollution grows. One method of controlling solvent vapors is incineration. When properly designed and installed, this method is very effective and capital costs are moderate. Other control methods are based on recovery and reuse of emitted solvent vapors. Three techniques are available: adsorption in a scrubbing liquid, condensation by cooling, and adsorption on activated charcoal. Of the three, activated carbon adsorption is the most generally applicable and is capable of achieving the highest degree of recovery.

10047

APTIC NO. 27762

Calvert, Seymour

AIR POLLUTION RESEARCH PROBLEMS.

Preprint, Air Pollution Control Assoc., Pittsburgh, Pa., 36p., 1970. (Presented at the Air Pollution Control Association, Annual Meeting, 63rd, St. Louis, Mo. June 14-18, 1970, Paper 70-24.)

A survey was conducted to determine the areas for air pollution research, and research topics are listed. Suggestions for the definition of sources such as power plants, metallurgical processes automobiles and transportation, rock processing, incineration and pulp and paper, and alternatives for an optimum solution are given. Topics for the development of better sampling and analytical method include gases, particles, odor, stack monitoring and visual. Other problem areas are in the field of control technology for gases, the use of filters, wet scrubbers, centrifuges and electrostatic precipitators for particulates, and control in such specific sources as fuel burning power plants, pulp and paper, metallurgical processing, automobile and transportation, rock processing, and incineration. There is also a need for more reliable and accurate cost data on air pollution control processes and equipment. Dispersion, tall stacks, modeling, and visibility are also discussed. Problem areas on the effects of air pollution on human health, animals and plants, and materials are described. The need for information on air quality criteria, air quality standards, emission standards and economics, sociology, and politics are also brought out.

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APTIC NO. 27793

Turpin, Alexander J.

FLARE STACK COMBUSTION TIP.

(Smoke-Ban Mfg., Inc., Pasadena, Tex.) U. S. Pat. 3,547,567. 9p., Dec. 15, 1970. 6 refs. (Appl. July 22, 1968, 10 claims).

One of the most important criteria for a combustion tip is that it provide for the burning of waste gases with little or no smoke production and the substantial elimination of odors and hazardous gases resulting from incomplete combustion. In general, previously proposed combustion tips have been rather narrowly limited in the amount of waste gas which can be burned per unit time without smoke production. In most instances, the failure to provide for an adequate supply of oxygen, such as air, has been the major deficiency of the known combustion tips. The present invention provides a new and improved flare stack combustion tip. Complete drawings of the tip are given. Large quantities of waste gases may be rapidly burned with little or no smoke production and the escaping of odors and hazardous gases to the atmosphere during the burning of waste gases is substantially alleviated. A continuous flame is provided with a significant reduction in fuel requirements as compared to conventional combustion tips; waste gases are readily ignited on exiting the combustion tip regardless of wind velocity and direction, and a substantially fixed flame stand-off from the exit of the tip is provided. The proposed flare stack combustion tip requires fewer pilot lights and allows an arrangement resulting in longer life for the pilot lights. Also, in comparison with present tips, the proposed flare stack combustion tip remains cooler during combustion of waste gases, thereby reducing metal deterioration due to high temperatures. The proposed flare stack combustion tip is constructed with a centrally disposed gas conduit which has an opening in the lower end for communication with a flare stack. The upper end of the stack is at least partially closed and has a plurality of spaced apart gas conducting channels extending outward from the gas conduit, in open communication along one end with the conduit. There is a gas emission orifice in an upper segment of each of the gas conducting channels, extending substantially the entire length of the upper segment. These orifices are disposed radially with respect to the axis of the gas conduit.

10049

APTIC NO. 27794

Jaffe, Joseph

HYDRODESULFURIZATION PROCESS.

(Chevron Research Co., San Francisco Calif.) U. S. Pat. 3,546,105. 2p., Dec. 8, 1970. 3 refs. (Appl. Aug 8, 1969, 2 claims).

Fluorine-containing catalysts have certain potential disadvantages based on the possibility of some fluorine loss from the catalyst during processing and on the possible corrosivity of resulting fluorine-containing compounds. There is a continuing need for further improvements in hydrodesulfurization processes, particularly because feedstocks containing appreciable amounts of heavier materials which must be desulfurized also contain appreciable amounts of metals, including nickel and vanadium. These metals are particularly detrimental to hydrodesulfurization processes because they form a coating on the surface of the catalyst particles, thus blocking off access of the hydrocarbon reactant molecules to the catalytically active sites within the catalyst particles. The present invention provides an improved catalytic hydrodesulfurization process using a catalyst of high activity and stability that does not contain fluorine. The components and weight percentages of the

catalyst are: alumina, 44.5%; nickel, 8%; molybdenum, 20%; titanium dioxide, 10%; and phosphorous pentoxide, 5%. The process consists of contacting organic sulfur compounds with hydrogen and the catalyst comprising a component in particulate form selected from titanium phosphate and zirconium phosphate, a continuous phase matrix comprising alumina, a component selected from nickel, cobalt, and oxides and sulfides of nickel and cobalt, and a component selected from molybdenum and tungsten. The titanium phosphate and zirconium phosphate component is dispersed in the matrix. The contacting is accomplished in a reaction zone under catalytic hydrodesulfurization conditions. The process removes hydrogen sulfide from the effluents of the reaction zone. The process is conducted at a temperature in the range 500-800 F, a pressure in the range 200-10,000 psig, a liquid hourly space velocity based on the hydrocarbon oil feedstock of 0.2 to 10, and a total hydrogen rate of 500 to 20,000 scf of hydrogen per barrel of hydrocarbon oil feed.

10050

APTIC NO. 27795

Schweitzer, Paul H. and Klaus Zeilinger

THE OPTIMUM AIR-FUEL RATIO FOR SPARK IGNITION ENGINES.

(Das optimale Luft-Brennstoff-Verhältnis fuer Ottomotoren). Text in German. MTZ Motortechnische Zeitschrift, 32(1):16-21, 1971. 5 refs.

The air-fuel ratio and consequently the air ratio lambda influences the course of combustion. Thus the ignition of a gasoline mix can occur only within ignition limits of 0.6 less than lambda less than 1.4. The air-fuel ratio also influences work pressure, specific fuel consumption and exhaust gas composition. In order to reduce exhaust gases to a minimum, the current concepts of a favorable air ratio must be redefined. While carbon monoxide levels decrease with increasing lambda, hydrocarbon exhaust levels begin to increase after lambda has reached a certain point. Their minimum lies, under normal circumstances, in the vicinity of lambda b minimum, mostly beneath it. Nitrogen oxides still manifest considerable levels at lambda b min, then decrease steeply. The new optimal air ratio lambda opt derived by theoretical considerations lies in a mixture area which is poorer than lambda b min, thus in an area where not only hydrocarbons reach their absolute minimum but where also the generation of nitrogen oxides is low. Experiments have confirmed the validity of the newly established optimal air-fuel ratio. The method which permits the calculation of the optimal air ratio for a desired median pressure is outlined.

10051

APTIC NO. 27796

Froelich, Kurt

RECOVERY OF SOLVENTS FROM EXHAUST AIR OF DEGREASING INSTALLATIONS.

(Lösungsmittelrückgewinnung aus der Abluft von Entfettungsanlagen). Text in German. Metalloberfläche, 24(11): 436-439, Nov. 1970.

The solvents used in degreasing installations consist mostly of chlorinated hydrocarbons like stabilized trichlorethylene or perchlorethylene. The degreasing installations which can be enclosed or open work on the immersion, spray or evaporation principle or on their combination. Losses of solvents in degreasing of metals can be attributed to distillation, to evaporation from the cleaned object outside the installation and to escape with exhaust air. This last loss which is the greatest can be prevented by adsorbing the solvents from the waste air on activated charcoal in an adsorber. A single layer

adsorber has a life of from 8-10 years with a kg charcoal absorbing up to 200 g solvent. Regeneration is accomplished with steam, the recovered solvent is returned to the degreasing process. Recovery installations are not economical where the yearly solvent consumption is less than 7000 kg. A single adsorber is recommended for degreasing installations using between 7000 and 13000 kg solvent per year. A higher yearly solvent consumption requires twin or a battery of adsorbers. The cost of these adsorbers runs from 3000 (850 dollars DM for a single to 25000 DM (7000 dollars) for a battery of adsorbers.

10052

APTIC NO. 27798

Isaksson, Goeran

DEVACLON-A NEW DUST CONTROL SYSTEM IN THE SWEDISH STONE-WORKING INDUSTRY.

(Devaclon-Ein neues System fuer Staubbekämpfung in der schwedischen Steinindustrie). Text in German. Staub-Reinhalte. Luft, 30(12):512-514, Dec. 1970.

The Devaclon dust control device used successfully by the stone-working industry in Sweden is a low volume high velocity exhaust system which is produced in a number of sizes. The small size is suitable for use in connection with a single dust generating tool like a pneumatic drill, larger sizes can service a number of parallelly working tools by means of long thin hoses. The small Devaclon device has an exhaust output of approx. 100 cu m/hour. With a work pressure of 6 to 7 atm compressed air consumption is 0.8 cu m/min. Dust is separated in 3 steps. In the first two step cyclones are employed, in the last step a fully automatic filter intercepts the finest dust particles. The bottom part of the device where the captured dust accumulates has a volume of 60 l. The device was tested by the Swedish Institute for Work Medicine in a granite quarry in connection with crush and split drilling. Air samples taken intermittently during the entire operation disclosed that the median dust concentration fluctuated between 0.4 mg cu m and 0.7 mg cu m while the dust concentration without dust removal was between 12.5 and 77 mg cu m with a silica content of 25%. The larger sizes of the device yielded comparable results.

10053

APTIC NO. 27800

Griwatz, Gunther H.

PRODUCT SURVEY REPORT. PHASE 1, TASK 2. MOISTURE SEPARATOR DEVELOPMENT PROGRAM.

MSA Research Corp., Evans City, Pa., AEC Contract AT(45-1)-2145, MSA-AC-720460, Rept. 2, 33p., Jan. 21, 1970.

NTIS: MSAR-70-9

The results are given of a survey of the commercial availability of equipment for use in separating entrained water droplets, particularly in the 1-10 micron range, from gas streams, under conditions varying from standard air to those encountered during a pressurized water reactor loss-of-coolant incident. Of 135 potential suppliers contacted, 47 did not reply; 55 could not supply suitable separators or components; 12 proposed to furnish separator while 3 declined and 18 offered media for separator service. As a result of evaluation from company-supplied data, two separator assemblies and one filter medium are recommended for testing. These were judged to be the only products both applicable and also off the-shelf (or nearly so); the other products require extensive development work beyond the scope contemplated at present. A tabular summary of the survey responses from each manufacturer contacted is included.

10054

APTIC NO. 27806

Spencer, Emmet F., Jr.

COMPLIANCE IN THE CHEMICAL INDUSTRY WITH NY-NJ AIR POLLUTION CONTROL RULES.

American Inst. Chemical Engineers, New York, American Society of Mechanical Engineers, New York, Proc. MECAR Symp. Design and Operation for Air Pollution Control, New York, 1968, p. 6-17. (Oct. 24.)

The approaches taken by a San Francisco plant to reduce particulate emissions from magnesia kilns in advance of Bay Area control deadlines are discussed to illustrate the problems facing New York and New Jersey chemical plants, particularly those with multiple air pollution sources, in complying with state emission standards applicable by January 1971. Specifically described are the modifications and alterations required before a baghouse and electrostatic precipitator system achieved troublefree operation at high efficiencies. It is emphasized that an adequate, reliable control system depends on early stack testing, clearly-defined priorities, a realistic achievable time schedule, pilot plant tests where indicated, and consultations with control officials.

10055

APTIC NO. 27808

Tennessee Valley Authority, Muscle Shoals, Ala., National Fertilizer Development Center

SULFUR OXIDE REMOVAL FROM POWER PLANT STACK GAS: AMMONIA SCRUBBING.

NAPCA Contract TV-29233A, Conceptual Design and Cost Study Series Study No. 3, Bull. Y-13, 322p., Oct. 1970. 96 refs.

NTIS: PB 196804

A series of studies on the removal of sulfur oxides from power plant stack gases is being carried out by the Tennessee Valley Authority for the Air Pollution Control Office (formerly NAPCA). Processes previously investigated involved the use of lime or limestone to convert the sulfur oxides into solid compounds (calcium sulfite and calcium sulfate) that are discarded. In this report, an evaluation is given of processes in which the oxides are recovered as intermediates for the production of fertilizer products that can be sold to offset the cost of operations. The processes are based on scrubbing with ammonia to obtain a scrubber effluent solution containing ammonium sulfite and ammonium bisulfite. These products are then treated to yield sulfuric acid, nitric phosphate, or ammonium phosphate sulfate. The processes are evaluated at length with reference to equipment, economic considerations, capital required, and profitability.

10056

APTIC NO. 27811

Seiler, E. N.

THE MANUFACTURER STUDIES AIR POLLUTION.

American Inst. of Chemical Engineers, New York, American Inst. of Mining, Metallurgical and Petroleum Engineers (AIME), New York, N. Y., American Society of Civil Engineers, New York, American Society of Heating, Refrigerating and Air-conditioning Engineers, New York, American Society of Mechanical Engineers, New York, and American Society for Testing and Materials, New York, Engineering Foundations Proc. MECAR Symp. New Developments Air Pollution Control, New York, 1967, p. 97-98. (Oct. 23.)

Exhaustive tests were conducted on ventilation discharges emitted from metal finishing operations such as bright dipping, acid deburring, cleaning, and plating. Ventilation ducts as well as separate scrubbing units are required for specific plating

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solutions; while source treatment of scrubbing liquor is feasible, automatic controls are necessary. The tests additionally indicated that source sampling procedures and subsequent chemical analysis must be carefully followed to obtain meaningful results. Performance ratings of air pollution control devices are misleading.

10057

APTIC NO. 27812

Sheppard, Stanton V.

CONTROL OF NOXIOUS GASEOUS EMISSIONS.

American Inst. of Chemical Engineers, New York, American Inst. of Mining, Metallurgical and Petroleum Engineers (AIME), New York, N. Y., American Society of Civil Engineers, New York, American Society of Heating, Refrigerating and Air-Conditioning Engineers, New York, American Society of Mechanical Engineers, New York, and American Society for Testing and Materials, New York, Engineering Foundation, Proc. MECAR Symp. New Developments Air Pollution Control, New York, 1967, p. 21-29. (Oct. 23.)

As a result of increasingly stringent air pollution control laws and regulations, the packed scrubber is being extensively used for controlling emissions of noxious gases to the atmosphere. There is also increasing acceptance of the cross flow scrubber design. With the proper type of packing, the crossflow scrubber has many attractive features when compared to the spray type or to the counter current or cocurrent packed designs. These features include lower pressure drop, lower recycle scrubbing liquid flow, and better solids handling capacity. New plastic materials available for these scrubbers are described. They enable a counterflow scrubber to have a dry weight of only 2000 lbs and an operating weight of 5100 lbs. Industrial applications of plastic tower packings with corrosion resistant glass fiber reinforced polyester shells are noted, and operating costs of various scrubber designs are compared.

10058

APTIC NO. 27818

Westall, George B., Jr.

AIR POLLUTION CONTROL—IT'S NOT ALL BAD% CHAR-BROILING-RESTAURANT.

Preprint, Air Pollution Control Assoc., Pittsburgh, Pa., 13p., 1970 (Presented at the Air Pollution Control Association, Annual Meeting 63rd, St. Louis, Mo., June 14-18, 1970, Paper 70-71.)

Char-broiling restaurants emit a dense smoke which is a fine aerosol mist of organic fat that carries a distinct odor. Not only do they present an external problem, but great amounts of grease are deposited throughout the ductwork of the exhaust system. Thus, these ducts are a concern as a possible source of fire and damage. The most effective method of control is through the use of an incineration system, as filters and water wash scrubber have not removed the aerosol grease particles to any degree of success. With proper temperatures and retention time, all odors and fumes are converted to carbon dioxide and water vapor. Excellent flame patterns are experienced with gas pressures of a 5 inch water column installed within air ducts having velocities of 2500 to 3000 feet per minute. Measurement of the exhaust air volume is a most important design consideration. Oxygen requirements are mentioned, as well as design features of the combustion and retention chambers. A high temperature fan must be incorporated within the system to withstand the high exhaust temperatures from the retention chamber. Incineration of char-broiling restaurant odors and fumes will require capabilities of producing a flame retention temperature of 1000 F for 0.3 second.

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APTIC NO. 27824

10059

Jesser, Benn W.

AIR RESOURCE MANAGEMENT IN THE PETROLEUM INDUSTRY.

American Inst. Chemical Engineers, New York and American Society of Mechanical Engineers, New York, Proc. MECAR Symp. Design and Operation for Air Pollution Control, New York, 1968, p. 26-31. Oct. 24.

By the end of 1968, the petroleum industry will have expended over a billion dollars in three years for air and water conservation. Of the \$380,000,000 earmarked for 1968, 45% is for air pollution control, 55% for water pollution control, and 8%, or 28.4 million dollars, for research and development. Technology is available to solve the problem of the projected rise in sulfur dioxide emissions but it is not economic at this time and continued research of considerable magnitude will be necessary to solve the problem. It can be hoped that controls restricting the sulfur content of oil to 1% or 0.3% will not be applied on a nationwide basis before the industry can develop commercially feasible flue gas and fuel desulfurization processes. With regard to desulfurization of fuel, the industry is at the threshold of commercial success, though the costs of desulfurization may increase the cost of fuel as much as 25-30%. Also under development are means and mechanisms for controlling lead and nitrogen oxide emissions from refineries. The means are already available for controlling particulates, carbon monoxide, and hydrocarbons.

10060

APTIC NO. 27833

Yamagishi, Giichi, Tadanori Sato, and Hiroyoshi Iwasa

THE STUDY OF TWO-STROKE CYCLE PETROL INJECTION ENGINE FOR EXHAUST EMISSION CONTROL.

(Haikagasu joka o mokuteki toshita 2-saikuro gasorinfunsha kikan no kenkyu). Text in Japanese. Nainen Kikan (Internal Combust. Engine), 9(94):11-25, March 1970. 9 refs.

A gasoline injection system for controlling hydrocarbons and other contaminants in the exhaust of two-stroke cycle engines is described. Since controlled fuel injection alone does not reduce emissions, the system includes a combined throttle and spark-timing-control device. With this device, engine output in the light load zone is controlled by spark timing, the throttle being kept partially open. When the device was installed on a small automobile engine with a swept volume of 356 cc, hydrocarbon concentrations were reduced to 500 ppm and carbon monoxide concentrations to 1.6% in a four-mode test. (Author abstract modified)

10061

APTIC NO. 27835

Russell, W. E.

THE RECOVERY OF FLUORIDE FROM SUPERPHOSPHATE MANUFACTURE.

Chem. Ind. New Zealand, 4(11):10-11, 13, Nov. 1968. 11 refs.

In the manufacture of superphosphate, finely ground phosphate rock is mixed with sulfuric acid in a continuous manufacturing process. Much heat is generated and gases are evolved containing mainly silicon tetrafluoride, carbon dioxide, and steam. A small water scrubbing system is described that permits a substantial part of the evolved fluoride to be recovered as 15% strength hydrofluosilic acid. This by-product is used for the fluoridation of public water supplies.

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APTIC NO. 27843

Colfer, J. M. and L. F. Schiemann

AUTOMOTIVE AIR POLLUTION-A PROGRESS REPORT.

(Beikokuso jidosha niyori taikiosen). Text in Japanese. *Nenryo Kyokaiishi (J. Fuel Soc. Japan, Tokyo)*, 50(526):88-105, Feb. 1971. 32 refs.

In many industrial countries the internal combustion engine has been singled out as a major contributor to atmospheric pollution problems. As a result, legislative bodies have acted to impose limits on pollutants from gasoline-powered vehicles. These automotive emissions regulations are reviewed along with the changes required in engines and fuels to meet the emission codes, and the impact of reduced automotive emission on the air pollution problem. (Author abstract modified)

10063

APTIC NO. 27844

Paynter, J. David, Joshua S. Dranoff, and S. George Bankoff
SUBOPTIMAL DESIGN OF AN SO₂-OXIDATION CATALYTIC REACTOR.

Ind. Eng. Chem. Process Design Develop., 10(2):244-250, 1971. 13 refs.

A fixed-volume tubular reactor for oxidation of sulfur dioxide over commercial vanadium pentoxide catalyst is optimized with respect to reactor radius and surface heat flux as a function of axial distance. The suboptimal method employs ordinary functional differential adjoint equations rather than partial differential equations. It differs from weighted residual approximations in that the dimension of the state and adjoint equations are not the same. The suboptimal design shows a nearly constant radius in the absence of a temperature constraint. (Author abstract)

10064

APTIC NO. 27849

TAME 6 FUEL OIL BEFORE IT GOES UP IN SMOKE.
Plant Operating Management, 88(2):35-37, Feb. 1971.

A new additive sold under the trade name Rolfite 101 and containing an oil soluble nitrogenous manganese complex reduces sulfur trioxide formation and accompanying acid-smut fallout caused by the combustion of high and low sulfur fuel oils. When added to 2.2% sulfur oil, the formulation reduced SO₃ levels at 10% extra air from 40 to 10 ppm. Almost no SO₃ was observed following the combustion of 1.5% sulfur oil at 20% excess air in contrast to an average 1.5 ppm. The additive promotes more complete combustion by conditioning hydrocarbon fuels and thus producing higher flame or burning temperatures. Other advantages of the additive are reduced boiler deposits, a five % increase in furnace efficiency, lower flue gas temperatures, and suppression of sulfur dioxide formation.

10065

APTIC NO. 27850

WILL THE NEW GASOLINES LICK AUTO POLLUTION? Consumer Repts., 36(3):156-159, March 1971.

This year, the auto industry reduced compression ratios and made other modifications in most of the 1971 engines to allow the use of lower-octane gasoline. This in turn has permitted oil companies to reduce or eliminate lead in some of their gasolines. Criticisms leveled at the new engines and gasolines include the charges that they may increase other atmospheric pollutants through decreased efficiency and fuel economy, produce hydrocarbon emissions that react more readily with sunlight to form smog, or cause valve recession. Some ecologists are also concerned about the environmental effects of

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phosphorus-containing additives being used as substitutes for lead. The validity of these charges is examined. It is concluded that low or no-lead gasolines are only a very small step in the direction of a 'clean' engine, which, in any case, should be only an intermediate goal. What the country clearly needs are alternatives to the automobile, not just its engine.

10066

APTIC NO. 27853

Palumbo, Francis J. and Foster Fraas

THE REMOVAL OF SULFUR FROM STACK GASES BY AN ELECTRIC DISCHARGE.

J. Air Pollution Control Assoc., 21(3):143-144, March 1971.

Both direct current and pulsed current, the latter obtained from a damped-wave spark gas oscillator, were used to treat gas mixtures containing sulfur dioxide, nitrogen, and air saturated with water. The reactions were carried out in a chamber similar to an electrostatic precipitator. The 33-min application of the pulsed current to gases at 140 C resulted in approximately 96% removal of the SO₂. In the absence of water, only 67% of the SO₂ was removed. Reaction products were identified as elemental sulfur and sulfuric acid. Nitrogen oxide formation was also observed in the presence of dry air. Based on the absorption of the nitrogen oxides in water with analysis for nitric acid, it was found that the addition of carbon dioxide to the dry increased the nitrogen oxide formation fivefold, and, when added to moist air, threefold. The nitrogen oxide tests not only illustrate the effectiveness of pulsing but indicate that the oxides may be indirectly related to the SO₂ removal. The quantity of reaction products formed with direct current was insignificant compared to that obtained with the pulsed current.

10067

APTIC NO. 27854

Barrett, A. A.

ELECTROSTATIC PRECIPITATORS—GUIDANCE FOR DESIGNERS AND PURCHASERS. Filtration Separation, 8(1):67-69, 71-73, Jan.-Feb. 1971. (Presented at The Filtration Society, London, April 14, 1970.)

Factors involved in designing a satisfactory electrostatic precipitator are presented to give guidance to a purchaser on what is important and what is not. Required efficiency of collection, the gas volume to be treated, gas temperature, fineness of the dust, the dust burden, available space, and several other factors are cited. Each precipitator manufacturer has his own basic design and on the receipt of an enquiry giving all the required information, it is his job to design a plant to suit the conditions best. Factors which must be considered by the manufacturer include spacing and the area of receiving electrodes, gas velocity through the treatment zone, the number of zones, type of discharge electrode, rapping of receiving and discharge electrodes, and high tension equipment. The basis of all precipitator design is the 'effective migration velocity,' which is the velocity at which the dust proceeds towards the receiving electrodes measured perpendicular to the plate surface. An equation for calculating the effective migration velocity is included, and factors which influence this velocity are presented. An analysis of test results to determine the effective migration velocity is described.

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APTIC NO. 27860

Cole, Edward L., Raymond F. Wilson, and Sheldon Herbstmann

DESULFURIZATION OF A HEAVY HYDROCARBON FRACTION.

(Texaco, Inc., New York, N. Y.) U. S. Pat. 3,551,328. 4p., Dec. 29, 1970. 6 refs. (Appl. Nov. 26, 1968, 15 claims).

Heavy hydrocarbon petroleum fractions contain sulfur compounds that effectively poison the catalysts used in converting the fractions to gasoline. The sulfur compounds are further objectionable because the combustion of the fuels in which they are contained results in the release of sulfur dioxide to the atmosphere. A significant reduction in the sulfur content of the heavy hydrocarbon fractions is achieved by oxidizing the sulfur compounds and subsequently contacting the hydrocarbon fractions with a lower paraffinic hydrocarbon solvent in a concentration sufficient to separate the oxidized sulfur compounds from the hydrocarbon fractions. The preferred oxidants are ozone, organic peroxides, organic hydroperoxides, and organic peracids. Catalysts used to promote the oxidation are selected from Group IV-B, Group V-B, and Group VI-B metals. The preferred solvents are alkanes containing from three to six carbon atoms.

10069

APTIC NO. 27862

Hayashi, Tsutomu

IMPROVED AND COMPACT COTTRELL DUST COLLECTOR.

(Denki shujin shochi no kairyo kogata keiryoka). Text in Japanese. Sangyo Kankyo Kogaku (Ind. Environ. Eng.), no. 65-66:39-44, 1969.

Electric dust collectors are effective and operating costs are low, but investment costs are high and space requirements are large. Therefore, small enterprises have made limited use of the collectors. There have been no basic improvements in the Cottrell collector for 60 years. Present dust collecting equipment for industrial purposes are classified into 6 types: electric, washing, filtering, centrifugal, inertia, and gravity. The diameter of dust collected by these collectors varies from 0.005 micron to over 100 micron. Gas molecules less than 0.0001 micron cannot be eliminated even by an electric dust collector. They must be treated by washing, neutralization, adsorption, reaction, or, when odors are present, by masking. Industrial dust and smoke are 100 to 1,000,000 times as big as these molecules, so that they can be trapped easily. A new electric dust collector, capable of trapping dusts less than one micron, is characterized by a gas velocity of 1.5-4 m/sec, improved the discharge apparatus, and an easily generated corona discharge. The collector is very compact so much less electric current has to be applied only several ma to less than 100 ma. The voltage is about half and the electric current 1/10 that of the Cottrell collector. Even with these improvements, the electric dust collector is still more expensive than other types, though operating costs remain low.

10070

APTIC NO. 27866

Toshima, Motohiko and Seichi Takeuchi

TEMPERATURE STABILIZER DEVICE WITH WATER SPRAY IN DRY TYPE DUST COLLECTOR.

(Kanshiki shujin sochi niokeru mizu supure ni yoru ondo chosetsu sochi). Text in Japanese. (Sumitomo Machine Industries, Osaka (Japan)) Japan. Pat. Sho 45-8320. 3p., March 25, 1970. (Appl. March 31, 1966, claims not given).

A temperature stabilizer used for dry-type dust collecting equipment, using high-temperature gas is defective in that when a temperature adjustment had to be made in a small range, the water pressure of the spray nozzle was lowered; therefore, when the pressure went below a certain point, the mist jetted from the nozzle became water drops, and evaporation within the stabilizer did not take place completely, thus interfering with the adjustment of the gas temperature. The invention concerns a device to keep the water pressure from the nozzle at an almost constant point. Through the same piping, another pipe is connected, leading to the air compressor. With the automatic temperature adjusting meter, which operates together with the thermometer change, and through the analog digital exchanger, it automatically controls the volume of water jetted from the spray nozzles and, at the same time, ejects the remaining water in the piping with compressed air, to prevent it from falling in drops. The analog digital converter changes the variation in the volume of pressure, into an electric signal and, according to the signals, the valves are opened or shut. In the equipment, the difference between the temperature detected by the thermometer and the prefixed temperature is changed into an electric signal to open and shut the magnetic valves. Since the pressure on the nozzles remains constant, use of the same sized nozzles ensures that the mist sprayed has a uniform diameter and allows complete evaporation and adjustment of water volume in a wide range, which in turn makes it possible to adjust the temperature of a small volume of gas exactly. By ejecting the remaining water in the piping and opening the air valve, when the water valve is shut, not only is the falling of water drops prevented, but also the clogging of nozzles can be prevented.

10071

APTIC NO. 27875

Makino, Kazutaka and Koichi Ilinoya

COLLECTION EFFICIENCY OF A SINGLE FIBER IN A FIBROUS FILTER AND IN A POROUS MEDIUM FILTER

(Seni no oyobi happojo rozai finuta no tanitu seni hoshukoritu). Text in Japanese. Kagaku Kogaku (Chem. Eng.), 33(12):1261-1265, Dec. 1969. 13 refs.

The theoretical and experimental investigation of the collection efficiency of a single nonisolated fiber in a fibrous filter is discussed. The theoretical development for the establishment of collection efficiency of a single fiber in the diffusion-dominated region begins with the following models: collection efficiency of a single fiber, movement of mass, and diffusion. Further calculations are performed for the collection efficiency in the interception region. Based on the two types of collection efficiency, an equation is derived that would explain the basic collection mechanism in the diffusion-interception dominant region. Statistical analysis of published empirical data in the light of the theoretical development leads to the derivation of a correlation equation for the collection efficiency of a single fiber in a fibrous layer filter. The equation is different from that of Friedlander in that interfiber interferences need not be taken into consideration in calculating the efficiency. Also for the equation, up to a certain range, interception and diffusion are both dominant, but eventually interception takes over beyond it. A similar analysis is also applied to a foam-type filters, and the correlation equation for the collection efficiency of a single fiber is derived.

10072

APTIC NO. 27876

Wishart, Donald J.

CONTROL OF HARMFUL EMISSIONS FROM ENGINE EXHAUSTS.

SAE Australasia, 39(6):205-207, Nov.-Dec. 1970.

The recent Australian Senate Select Committee report on air pollution indicates that every one pound of gasoline burned in cars, roughly one half pound of harmful products is discharged. Per pound of gasoline these products include 0.417 lb carbon monoxide, 0.042 lb hydrocarbons, 0.014 nitrogen oxides, and 0.002 lb others such as sulfur and lead compounds. Formation of carbon monoxide depends almost entirely on the ratio of air to fuel. If the mixture is rich there is not enough oxygen for complete oxidation of the carbon of the fuel. Causes of unburned hydrocarbons include flame quenching, the use of richer than stoichiometric mixtures, use of a fuel with too high a final boiling point, precombustion reactions, and misfiring. Nitric oxide concentrations in exhaust gases are related to peak combustion temperature, the lower the temperature the lower the NO concentration. A typical series of curves of air/fuel ratio versus CO, HC, and NO concentrations in exhaust gas are presented. Operation at either a rich or lean mixture is mentioned, as well as use of the Wishart split cycle. Because the Wishart cycle is particularly amenable to stratified combustion, lean mixtures can be used with resultant complete oxidation of the fuel to carbon dioxide and water. The split cycle engine operates on lead free fuels so that this source of air pollution is eliminated. Results of emission tests are mentioned.

10073

APTIC NO. 27878

Nakai, Yoshiyuki

ON DESULFURIZATION OF WASTE GAS.

(Haigusu datsuryu ni tsuite). Text in Japanese. Preprint, Society of Electro-chemistry, Tokyo (Japan), Kanto Div., 27p., 1971. (Presented at the Seminar on Air Pollution, Tokyo, Japan, Feb. 3-4, 1971, Paper 6.)

Of the various flue-gas desulfurization processes that have been developed, few appear practical for commercial application with the possible exceptions of the active carbon, activated manganese oxide, alkalinized alumina, and vanadium catalyst methods. A new device for desulfurizing smoke discharged from power station boilers has been tested in the field and found to have a 95% efficiency for both dust separation and desulfurization. The desulfurizer is a wet system that treats smoke with either water or alkaline solution and recovers sulfur in the form of a 15% concentration of sulfurous acid soda. The device promotes the diffusion of smoke by the introduction of air jets or other high-temperature smoke. To increase the rate of absorption, the device is equipped with 13 cylindrical nets on which liquid drops fall successively until each net is covered by a thin, continuously renewed film. River pollution from the discharged acid waste water is avoided by neutralizing the water with lime. Other features of the desulfurizer include low pressure loss, low operating costs, and compactness plus flooding-free and channeling-free operation.

10074

APTIC NO. 27952

Sheikh, Morris I.

AIR STERILIZATION PROCESS.

(Assignee not given.) U. S. Pat. 3,547,576. 4p., Dec. 15, 1970. 10 refs. (Appl. Feb. 26, 1968, 8 claims).

A process for sterilizing air contaminated by bacterial organisms is based on the exposure of iodine crystals to a current of air and the subsequent volatilization and incorporation of the iodine into the air. The mixture of air and iodine is then washed with an iodine holding liquid which captures the iodine and holds it in liquid form against evaporation. The result is sterilized air free of bacterial organisms and iodine. The iodine holding liquid is a liquid organic compound having a flash point of at least 200 F and selected from the group consisting of ammonium, alkaline earth and alkali metal salts, and alkaline hydroxides. The organic compound serves the purpose of complexing the liquid and holding it in biocidally active form. The process can be carried out in an essentially portable machine.

10075

APTIC NO. 27953

Bowen, Henry D. and Charles P. Stanley, Jr.

SEPARATOR HAVING ADJUSTABLE LOUVERS WITH CLEANING MEANS THEREFOR.

(Assignee not given.) U. S. Pat. 3,550,357. 4p., Dec. 29, 1970. 11 refs. (Appl. June 13, 1968, 3 claims).

Various arrangements of louvers have been used to remove particles from polluted air streams, but no configuration has been able to remove over 90% of particles the size of bran or smaller or 50% of particles between 10 and 20 micron in diameter. The present louver separating device achieves maximum air exhaust with minimum particle escape by automatically adjusting the distance between louvers in accordance with existing conditions of air velocity and pollutant concentration. The device includes a wedge-shaped housing composed of a pair of parallelly disposed trapezium-shaped side walls. Extending across the upper open portion of the housing and adjustably mounted in a series of curved slots along the upper edges of the side walls are elongated, curved louvers. A photoelectric cell monitors the rate of particle escape in the air passing between the louvers and automatically activates control arms which close the distance between the louvers until particle concentration is reduced to a predetermined acceptable level. The louvers are automatically cleaned by pressurized fluid supplied through a moveable conduit.

10076

APTIC NO. 27954

Hamner, Glen P. and Ralph B. Mason

HYDROGENATION CATALYSTS ON CHARCOAL IN GUARD CHAMBER FOR REMOVING METALS FROM PETROLEUM RESIDUA.

(Esso Research and Engineering Co., Baton Rouge, La.) U. S. Pat. 3,546,103. 2p., Dec. 8, 1970. 7 refs. (Appl. Feb. 3, 1969, 9 claims).

The higher boiling fractions of crude petroleum often contain traces of vanadium, nickel, and other metals which cause rapid deactivation of sulfur-resistant catalysts used in the desulfurization of such fractions. Previous attempts to remove the metals from feedstocks prior to desulfurization have centered on contacting the petroleum with bauxite in the presence or absence of hydrogen or with alumina in the presence of hydrogen. The disadvantages of these processes is that the metals are difficult to remove from the contact materials. This problem is eliminated by first contacting the feedstock in a guard chamber containing a hydrosulfurization catalyst supported on a charcoal or activated carbon base at elevated temperature and pressure in the presence of hydrogen. The metals and coke precursors deposited on the base are easily recovered by the burning or steam gasification of the base.

CONTROL METHODS

10077

APTIC NO. 27955

McCabe, Robert V.

FILTER AND SHAKER MEANS THEREFOR.

(Assignee not given.) U. S. Pat. 3,550,358. 9p., Dec. 29, 1970. 15 refs. (Appl. June 3, 1968, 8 claims).

The most efficacious method for cleaning tubular filters or bags and other suspended filtering media involves the motions of twisting and/or stretching accompanied by shaking motions of the serpentine or sinusoidal variety. Thus, a means is provided for periodically imposing these combinations of cleaning motions. In many types of filtering devices in use today, it is necessary to remove the filters at frequent intervals for replacement or cleaning purposes. Nor does the use of throw-away filters avoid the problem of periodically shutting down the equipment. In a filter unit having at least one suspended pliable filtering member, a combination is provided which comprises the suspending means, a rigid support, a pair of link members for loosely suspending the support from the supporting structure, transmission means coupled in an off-center fashion from the support, and means for reciprocating the transmission apparatus to impart shaking movements to the support and to the filtering member.

10078

APTIC NO. 27956

Wilson, Harold W.

PROCESS FOR THE ENTRAPMENT OF SULFUR DIOXIDE GAS.

(Golden Cycle Corp., W. Va.) U. S. Pat. 3,547,583. 6p., Dec. 15, 1970. 8 refs. (Appl. Jan. 2, 1968, 15 claims).

By the utilization of a combination of mixed metallic oxides and metallic silicates, an economically feasible process is provided for the entrapment of sulfur dioxide from waste stack gases. When a ratio by weight of approximately 1 part of pulverized metallic oxides-metallic silicates is mixed with approximately 2.5 to 7 parts by weight of water, a moderately alkaline system results which is caused by the hydrolysis of the alkaline base compounds, i.e., basic calcium and magnesium oxides and silicates. The system becomes strongly acidic as a result of the formation of sulfurous acid when sulfur dioxide-containing gas is passed into the moderately alkaline system. Dissolution of the metallic oxides and silicates by the sulfurous acid brings about the formation of dehydrated silicic acid. With a relative deficiency of water in the system, the viscosity of the aqueous metallic oxide-metallic silicate system increases as a result of the partial dehydration of the dehydrated silicic acid, becoming hemihydrated silicic acid at which point the system gels. The gel can be processed for the recovery of sulfur.

10079

APTIC NO. 27957

Abboud, Harry I.

GAS PURIFICATION PROCESS AND APPARATUS.

(Assignee not given.) U. S. Pat. 3,550,356. 5p., Dec. 29, 1970. 12 refs. (Appl. Jan. 5, 1968, 9 claims).

An improved process and apparatus are provided for the wet scrubbing and cleaning of aerosols, fumes, or finely divided solids from industrial gases. Most conventional designs have high pressure drops, high power requirements, complex designs which require undue maintenance and high capital costs, low efficiency, or a high susceptibility to pluggage. The present process contemplates flowing a concentric layer, sheet or substantially continuous film of liquid generally downward while tangentially contacting the liquid with swirling aerosol-laden gases, fumes, or finely divided solids, to denude or

clean the latter and deposit solids or fumes within the liquid. Preferably, a plurality or sequence of such wet scrubbing steps is employed. Each stage is characterized by a pair of concentric vertically mounted tubes, a large diameter tube provided with one or a plurality of tangential dirty gas inlets, and an inner smaller diameter tube which leaves an annular space between the tubes wherein frustoconic or bowl-shaped distributor plates and troughs are mounted. The latter provide means for gas passage and to aid in the distribution of liquid along the inside walls of the outer tube.

10080

APTIC NO. 27958

Hettick, George R. and Donald M. Little

RECOVERY OF AMMONIA AND SULFUR FROM WASTE STREAMS.

(Phillips Petroleum Co., Bartlesville, Okla.) U. S. Pat. 3,551,102. 6p., Dec. 29, 1970. 4 refs. (Appl. Feb. 23, 1968, 9 claims).

A process is provided for the recovery of ammonia and sulfur as products from an hydrogen sulfide-ammonia containing stream. The off-gas obtained from the sulfur plant is contacted with a sulfolan which selectively extracts ammonia and sulfur dioxide, thus forming a sulfolane solvent phase rich in ammonia and SO₂ from which NH₃ can later be separated leaving SO₂ in the sulfolane. Preferably, the initial stages being at a lower temperature than the later stages wherein ammonia is released and SO₂ is retained with the sulfolane solvent. The SO₂ can be stripped from the sulfolane and returned to the sulfur plant for conversion to free sulfur. An aromatic hydrocarbon can be used as the absorption medium with which to contact the off-gas stream obtained from the sulfur plant. The stream can also be contacted with iron oxide to remove sulfur compounds prior to recovery of NH₃.

MEASUREMENT METHODS

10081

APTIC NO. 20965

Wert, S. L.

A SYSTEM FOR USING REMOTE SENSING TECHNIQUES TO DETECT AND EVALUATE AIR POLLUTION EFFECTS ON FOREST STANDS.

Preprint, Forest Service, Berkeley, Calif., Pacific Southwest Forest and Range Experiment Station, 10p., 1969 (7). 6 refs.

About 100,000 acres of pine forest stands near Los Angeles, Calif. were investigated for damage by a remote sensing technique using aerial photography and certain statistical procedures, in order to find the number of trees as well as the area affected. Along each flight line, 1:8000-scale vertical air photography was exposed in a continuous strip, simultaneously with 1:1584-scale photographs exposed in triplets at 10-sec intervals, started at random after beginning the small-scale coverage. The processed large-scale photos were interpreted in terms of moderate or severe decline; needle retention, needle length, branch mortality, and crown color were recorded for each evaluated tree. A second-stage sample was selected by probability proportional to tree count on aerial photographs. Field crews on the ground made estimates of the variables listed above two previously selected sample triplets, thus constituting the third-stage sample. All computations were made on a small desk-computer; the formula for estimating the number of trees affected was based on the probability of line

selection, area covered by each flight line, area covered by triplets in flight line, ground count of affected trees per triplet visited, and probability of triplet selection. The results indicated that 1,298,073 (plus or minus 25%) trees were affected by air pollution; the standard deviation of the estimate might have been reduced through more accurate photo interpretation of tree counts in the second stage, as the correlation between photo interpretation and ground tally was only fair. The cost of the survey was about 3 cents per acre.

10082

APTIC NO. 21041

Leroux, Jean and Mazhar Mahmud

FLEXIBILITY OF X-RAY EMISSION SPECTROGRAPHY AS ADAPTED TO MICROANALYSIS OF AIR POLLUTANTS.

J. Air Pollution Control Assoc., 20(6):402-404, June 1970. 6 refs.

Methods for analyzing thin dust coatings of airborne particulates were evaluated for their applicability to vast air pollution surveys. Choice of glass fiber filters adapted to high volume samplers restricts the analysis to a limited number of elements, such as lead. More flexibility and versatility are attained through the use of organic membrane filters mounted in small plastic monitors which permit multi-elemental analysis at least as accurately as with other popular but time consuming techniques. Due to the small area of coating irradiated by x-ray (usually 1.5 sq cm), the size of the filter in the monitor can be as small as 7 sq cm. Under these conditions, shorter intervals of sampling are obtained as compared to the 25 hr sampling time required with conventional hi-volume sampler using 8 by 10 in. glass fibers. Since the method is non-destructive, the sample is analyzed directly as received, thereby decreasing the number of possible experimental errors. Its accuracy in the range of sensitivity required for an average air pollution sample is at least as good as that of atomic absorption. The major delay with x-ray analysis is the sampling time itself, since approximately 5 minutes is required for the analysis of a single element after receipt of sample, as compared to several hours for other conventional techniques. These qualities of speed and accuracy allow shorter intervals of sampling with are normally required for better statistical assessment of broad air pollution surveys. The sensitivity of the technique reaches a value close to 0.05 micrograms/cu m. (Author abstract modified)

10083

APTIC NO. 21271

Goetz, Alexander

DEVICE AND PROCESS FOR COLLECTING PARTICULATES FROM GASES.

(California Inst. Research Foundation, Pasadena) U. S. Pat. 3,475,951. 8p., Nov. 4, 1969. 5 refs. (Appl. May 18, 1965, 14 claims).

A device for collecting submicron size particles is described. The device consists of an impaction nozzle and a polished opaque collecting plate. The nozzle directs parallel gas flow paths toward and away from the plate, with a 180 degree turn about a knife edge at the plate. A nozzle inlet passage with a continuously decreasing cross section provides a continuous and uniform gas acceleration, a double slit nozzle, and a collecting plate drive which moves the plate in steps of varying velocity with each step of a constant velocity. The particulate concentration is determined by light scattering measurements. (Author abstract modified)

10084

APTIC NO. 21279

Dams, R., J. A. Robbins, K. A. Rahn, and J. W. Winchester

NONDESTRUCTIVE NEUTRON ACTIVATION ANALYSIS OF AIR POLLUTION PARTICULATES.

Anal. Chem., 42(8):861-867, July 1970. 10 refs.

A computer-assisted neutron activation analysis procedure is described which permits the nondestructive analysis of air pollution particulate matter for up to 33 elements in solid form. For measurements of short-lived isotopes, samples are first irradiated for 5 min at a flux of 2 times 10 to the 12th power neutrons/sq cm sec. The samples are then irradiated for 3 min after which a count of 400 sec live-time duration is begun; this is followed by a count of 1000 sec live-time starting 15 min after irradiation. For measurements of long-lived isotopes, samples are irradiated at a higher flux (1.5 times 10 to the 13th power neutrons/sq sec) for 2-5 hrs. Next, the samples are counted once for 2000 sec live-time after 20-30 hrs of cooling and then for 4000 sec live-time after 20-30 hrs of cooling. All spectra are recorded on magnetic tape and the data automatically reduced. The computer program qualitatively determines the presence of isotopes; calculates net peak areas; converts areas to weights of trace elements; and calculates concentrations of trace elements in the originally sampled air. Both the irradiation and counting procedure are graphically illustrated, and the gamma transitions used are listed. The reproducibility of the method is indicated by the results of replicate determinations of aerosols collected in the southern Lake Michigan basin.

10085

APTIC NO. 21284

Schuetz, Herbert

GAS ANALYTICAL CONTROL OF REFUSE INCINERATION PLANTS.

(Gasanalytische Ueberwachung von Muellverbrennungsanlagen). Text in German. *Wasser Luft Betrieb*, 14(4):152-156, April 1970.

To avoid excessive emission of air pollutants by refuse incinerators it is useful to measure the sulfur dioxide, sulfur trioxide, hydrogen chloride, and nitrogen oxide concentrations. One versatile method is based on the specific infrared absorption of various hetero-atomic gases. The infrared analyzer consists of two infrared radiators, the radiation of which is equal-phase modulated. The component which is to be measured absorbs part of the infrared radiation. As a consequence, the receiver chamber is less heated up than the comparative chamber which receives the full infrared radiation. The temperature difference between the receivers is a function of the concentration of the component to be measured. This method can be used for measuring CO, SO₂, NO, and CO₂. For measuring NO₂, ultraviolet and visible light absorption from 0.2 nm to 0.8 nm is used. For measuring chlorine and hydrogen chloride, an electroconductivity analyzer is used. For measuring SO₃, dew point measuring units are used. The oxygen analyzer takes advantage of the paramagnetic properties of oxygen. The concentrations are usually continuously measured. To guarantee smooth operation of the various analyzers, the gas must be sampled and cleaned, the condensate precipitated, and the interfering components removed. A measurement system for flue gas monitoring in an incinerator is illustrated and discussed.

10086

APTIC NO. 21724

Hendrickson, E. R., J. E. Roberson, and J. B. Koogler

CONTROL OF ATMOSPHERIC EMISSIONS IN THE WOOD PULPING INDUSTRY. VOLUME 3. (FINAL REPORT).

Environmental Engineering, Inc., Gainesville, Fla., and Sirrine (J. E.) Co., Greenville, S. C., Contract CPA 22-69-18, 250p., March 15, 1970. 418 refs.

CFSTI: PB 190353

Chapters 9 through 13 are contained in this third and final volume of a study of control of wood pulping emissions. Chapter 9, which includes 237 references, reviews sampling and analytical techniques, grouped under emission source or ambient conditions, for kraft, sulfite, and NSSC pulping processes. For each grouping, recommendations are made of the best available procedures. An annotated bibliography of 174 papers related to on-going research in pulping emissions control comprises Chapter 10; references are grouped under eight subjects. Recommendations for future research and development are made in Chapter 11. Chapter 12 presents estimates of present pulping industry investment and operating costs for emissions control. The cost analyses are based on prices of chemicals and equipment as of Jan. 1969. Chapter 13 reports the development of a model which provides data applicable for projections of investment and operating costs for emission control in the kraft pulping industry through 1980. A sensitivity analysis suggests how the costs for emission control are influenced by emission standards, value of recoverable chemicals, and assumed rate of return. A mathematical programming model is also presented, by which it is possible to determine for any specified mill the optimal way to satisfy specified emission standards and maximize net revenue from emission control. An example is analyzed with the model, using the 1969 Oregon regulations and based on Jan. 1969 prices.

10087

APTIC NO. 21835

Hodgeson, J. A.

REVIEW OF ANALYTICAL METHODS FOR ATMOSPHERIC OXIDANTS MEASUREMENTS. Preprint, California State Dept. of Public Health, Berkeley, California Air Resources Board, Los Angeles, California Univ., Berkeley, Public Health Service, Washington, D. C., National Air Pollution Control Administration, 24p., 1970. 38 refs. (Presented at the Conference on Methods in Air Pollution and Industrial Hygiene Studies, 11th, Berkeley, Calif., March 30, 31, and April 1, 1970.)

Currently used oxidant measurement methods and instrumentation were surveyed with emphasis on how these techniques meet the requirement of the California air quality standard for oxidants. Available methods were classified as manual laboratory methods, batch techniques to determine long-term exposures, and continuous field methods. The most widely used laboratory procedure is the 1% neutral buffered potassium iodide method for the determination of ozone. This is also the reference method for air quality standards currently being established at the federal and state levels. It is simple and reasonably accurate but suffers from interference from sulfur dioxide, hydrogen sulfide, and carbon dioxide. Due to the instability of the iodine produced, analysis must be completed soon after sampling, and skilled laboratory technique must be applied to obtain good precision at low levels of ozone. Alternative manual methods are attractive but require additional development. Batch methods of ozone determination sacrifice

in accuracy to obtain simplicity. The two in current use, bubbler boxes and the rubber cracking method, are adequate for inexpensive survey methods and comparative qualitative data, but that is their limit. Continuous measurement instruments in use today are all based on the potassium iodide reaction and detection of the iodine product by either colorimetric or coulometric principles. They suffer the same interference problems as the manual iodine methods. Also, being based on a wet chemical reaction, their continuous operation presents some problems in maintenance and supply. Several methods under development are not wet chemical. They are continuous real-time systems designed for the specific determination of atmospheric levels of ozone. One of these, a surface ozone monitor utilizing a chemiluminescent approach, has been fabricated and six prototypes are undergoing field evaluation. Specific determination of ozone may also be accomplished by the use of ultraviolet absorption in the 260 millimicron region. A key question as yet unanswered, however, is whether the measurement of atmospheric ozone is a true measure of the atmospheric oxidant level.

10088

APTIC NO. 22190

Stafford, Ronald G. and Harry J. Ettinger

EFFICIENCY OF IPC-1478 FILTER PAPER AGAINST POLYSTYRENE LATEX AND DIOCTYL PHTHALATE AEROSOLS.

Los Alamos Scientific Lab., N. Mex., Contract W-7405-ENG. 36, Rept. LA-4356, 11p., May 1970. 7 refs.

IPC-1478 filter paper efficiency was evaluated using polystyrene latex and dioctyl phthalate aerosols. Efficiency was measured as a function of particle size, filtration velocity, and filter mass loading. Experimental results for 0.557 micrometers and larger particle sizes indicate that this medium has limited effectiveness under high-velocity and high-loading conditions. Differences in efficiency were observed when this medium was tested with solid and liquid aerosols. (Author abstract modified)

10089

APTIC NO. 22639

McMahon, Clifford C.

PARTICLE SIZE ANALYSIS BY THE METHOD OF MUSGRAVE AND HARNER.

Ceram. Bull., 49(9):794-796, Sept. 1970. 16 refs.

A simple theory of the turbidimetric method of particle size measurement is discussed with special reference to the work of Musgrave and Harner, whose calculations are corrected and simplified, making the method even more suitable for quality control work. The theory considers the effect on the output of a photovoltaic cell of the projected shadow area of particles in a beam of light falling on it, but does not depend on the notion of an equivalent hiding factor. Extinction coefficients are included to allow for the fact that for small sizes the shadow projected area of a particle is not proportional to its diameter.

10090

APTIC NO. 23107

Terabe, Mototsugu

MEASUREMENT OF AIR POLLUTION AND SOME ASSOCIATED PROBLEMS.

(Taikosen no sokutei to nisan no mondaiten). Text in Japanese. Kukichowa to Reito (Air Conditioning Refrig.), 10(2):56-64, Jan. 15, 1970. 3 refs.

The methods of atmospheric pollutant measurement are divided into two groups: one dealing with the environmental density of pollutants and the other at the sources with the flue

gas or automotive exhausts. For the latter, a number of Japanese Industrial Standards has recently been established. For the measurement of falling dusts, a deposit gauge and a dust jar are used. For the suspended dusts or fumes, three kinds of samplers, tape, high-volume, or Andersen samplers, are described. Sulfur oxides in the air are monitored by lead dioxide, rosaniline or electro-conductivity methods. Electro-conductivity is not affected by NO₂ existing with SO₂, but is considerably dependent on Cl, HCl, or NH₃. The rosaniline method, on the other hand, is affected by NO₂, which can be counteracted by sodium azide or sulfamine acid. Nitrogen oxides, NO₂ or NO, are monitored by Saltzman, phenol disulfonic acid, or an automatic continuous method utilizing colorimetry. The automatic recorders can be calibrated by a permeation tube. An example employing DuPont's fluorinated ethylene propylene resin is described. For the measurement of odor in the atmosphere, the ASTM method, a dilution method, is recommended. Definitions of an odor unit, concentration, and emission rate are given, together with a method of calculating odor concentration and odor threshold. For the details of the measurement the reader is referred to the references.

10091

APTIC NO. 23169

Dubois, L., A. Zdrojewski, P. Jennawar, and J. L. Monkman
THE IDENTIFICATION OF THE ORGANIC FRACTION
OF AIR SAMPLE.

Atmos. Environ., 4(2):199-207, 1970. 11 refs.

In the measurement of airborne polycyclic aromatic hydrocarbons using ultraviolet spectrophotometry, non-specific absorption is observed which increases as the wavelength decreases. This absorption or 'background' can be caused by the presence of airborne aromatic compounds from lubricating oil and/or fuel oil due to evaporation, volatilization, and incomplete combustion. Oxygenated compounds present in the organic extract of air samples are also responsible for a background. The air sample extract was obtained by putting in a Soxhlet extractor circles cut from glass fiber sheets and refluxing for 6 hr with 50 ml of cyclohexane. After evaporation of the solvent with a flow of clean nitrogen (3 hr), the residue was weighed and redissolved in iso-octane so that an aliquot of 5 ml contained 10 mg. The 10 mg oil sample measured by weighing was also dissolved in 5 ml iso-octane. Samples were placed on columns 1 cm in inside diameter and 30 cm in length, filled to a depth of 12.5 cm with 28-200 mesh activated silica gel. The gel was activated by heating it overnight at 140 C. The columns were then eluted with 400 ml of iso-octane, and all the fractions were combined to form the aliphatic group. By eluting with 100 ml of benzene, the aromatic group was then obtained, and finally the oxygenated compounds were obtained by elution with 100 ml of ethyl alcohol. These groups and composites were studied by ultraviolet absorption, fluorescence, and infrared and gas chromatography. Some suggestions are made towards improving the chromatographic separation and minimizing the background effect. (Author abstract modified)

10092

APTIC NO. 23320

Ray, Eugene M.

SAMPLING AND DETERMINATION BY ULTRAVIOLET
ABSORPTION OF OIL MISTS AND SOLVENT
VAPORS.

Am. Ind. Hyg. Assoc. J., 31(4):472-478, July-Aug. 1970. 5 refs.

A specific and sensitive method for oil mist determination was desirable to evaluate underground construction areas, tunnel

environment, compressor-supplied breathing air, and respirator tank air. Several petroleum oils have shown similar absorbance patterns in the ultraviolet range of the spectrophotometer. All examined are at least sensitive enough to give reproducible absorbance readings at concentrations of 25 micrograms/ml of solvent. This implies that a sample containing 125 micrograms can be diluted to 5 ml with chloroform and accurately measured, which would require an air sample of only 25 liters at the TLV for oil mist. If a gravimetric method is used, 200 liters of sample are required for accurate weighing on an ordinary analytical balance, while it also must be assumed that no other airborne material is collected in the sample. Through proper choice of sampling method, organic solvent vapors are believed not to interfere with the determination of oil mist. Filters and the electrostatic precipitator are not likely to collect vapors, but a bubbler might be expected to collect both vapors and mists. Various thinners and sealing materials were examined in the spectrophotometer.

10093

APTIC NO. 23591

Best, Gordon T.

DAYTIME TRACKING OF A HIGH-ALTITUDE VAPOR
TRAIL.

J. Atmospheric Sci., 27(6):979-980, Sept. 1970. 2 refs.

In a comparative analysis of several alternative systems for daylight tracking of vapor trails, it was determined that a useful instrument could be realized by building differential radiometer which would compare the signal from a small field of view in two narrow adjacent spectral regions, only one of which contained the spectral emission feature of the vapor trail. The advantage of the radiometer technique is that detection depends not only on the ratio of feature to background intensity, but rather on the ratio of the square of the feature intensity to the product of the background intensity and the electronic bandwidth of the system. Using commercially fabricated interference filters of 2.5 Å half-width, a simple instrument of this type was built. The solid angular field at the filter was 0.01 rad diameter, determined by the spatial resolution required in object space. By adding an afocal telephoto system, it is possible to achieve at least a ten-fold increase in throughput with a consequent three-fold gain in signal-to-noise ratio, without significantly degrading the spectral resolution. The instrument was set up at Tyndall AFB, some 120 km to the east of the launch site at Eglin AFB, and used to track a trail of lithium vapor from a Nike-Iriquois rocket.

10094

APTIC NO. 25535

Sugawara, V. and V. Yamazaki

THE DETERMINATION OF HEAVY METALS IN DUST-
FALL BY ATOMIC-ABSORPTION-
SPECTROPHOTOMETRY.

(*Genshi kyuko bunsekiho niyuru koka baijinchuno junkin-zoku no teiryō*). Text in Japanese. *Taiki Osen Kenkyū (J. Japan Soc. Air Pollution)*, 4(2):182-187, Nov. 1970. 14 refs.

Atomic-absorption-spectrometry was used for the determination of metals in several materials. In one application, the elements of iron, copper, lead, and zinc in dustfall (ash) were determined. For this purpose, the extraction or addition of organic solvents or dilutants was used, since analysis sensitivity is enhanced. The results of a dilution experiment are presented. Dustfall was treated with nitric, hydrochloric, and perchloric acids and mixtures of the acids. Treatment with hydrochloric acid was the most successful. Experiments involving alkali fusion are discussed. The two detection methods adopted were the calibration curve method and the standard

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addition method. The calibration method is easier to operate, but the addition method is more reasonable to protect against interference. Metal absorption is measured by the addition method was not always high. (Author abstract modified)

10095

APTIC NO. 27695

Feldstein, M., J. D. Coons, H. C. Johnson, and J. E. Yocum
THE COLLECTION AND INFRARED ANALYSIS OF
LOW MOLECULAR WEIGHT HYDROCARBONS
FROM COMBUSTION EFFLUENTS.

Am. Ind. Hyg. Assoc. J., vol. 20:374-378, Oct. 1959. 13 refs.

Low molecular weight hydrocarbons emitted by combustion and incineration processes can be directly determined by infrared analysis following absorption of the hydrocarbons in a gas cell with a ten-meter path. Concentrations of these hydrocarbons are expressed as propane after correcting the absorbance at 3.4 micron for the contributions made by methane, ethylene, acetylene, propylene, and butene-1. Effluent samples are collected in stainless steel tanks and passed to the gas cell through an ascarite trap. Typical analytical results for combustion effluents are tabulated, and typical spectra are presented for several combustion effluents and for mixtures of methane, acetylene, ethylene, propylene, and butene-1.

10096

APTIC NO. 27701

Adams, R. E., R. L. Bennett, and W. H. Hinds
IODINE CHARACTERIZATION SAMPLERS.

In: Reactor Chemistry Division Annual Progress Report. Oak Ridge National Lab., Tenn., Reactor Chemistry Div., Contract W-7405-eng-26, Rept. ORHL-4229, p. 158-160, March 1968. 3 refs.

A modification of the widely used May-pack iodine sampler, using a silver honeycomb as the first section, is described for use in separating and measuring the various forms of iodine present in experiments conducted under simulated nuclear accident conditions. Requirements are remote operation at elevated temperatures and humidities. The use of a silver honeycomb as a separation device for molecular iodine and larger aerosol particles is based on the much larger diffusivity of the former. Test results demonstrate the capability of the honeycomb to retain iodine and not remove methyl iodide and particles; on the basis of the excellent separation observed, this design is judged far superior to all other May-pack arrangements examined.

10097

APTIC NO. 27702

Parker, G. W., H. Buchholz, and R. J. Davis

CLASSIFICATION OF SUBMICRON PARTICLES BY A
LOW-PRESSURE IMPACTOR.

In: Reactor Chemistry Division Annual Progress Report. Oak Ridge National Lab., Tenn., Reactor Chemistry Div., Contract W-7405-eng-26, ORNL-4229, p. 156-157, March 1968. 1 ref.

A low-pressure impactor which separates particles into seven ranges (including a range caught by a final membrane filter) is briefly described. The ranges are indicated by the following particle diameter cutoff points: 2.0, 0.76, 0.29, 0.11, 0.036, 0.012, and less than 0.012 microns (for particles with a density of 5.0). The device is simple and is recommended for use in nuclear safety containment studies. Supplementary equipment provides the required aerosol flow (8 l/min) at the required pressure (40 mm Hg). (Author summary modified)

10099

APTIC NO. 27710

10098

Hall, N. J., N. L. Morrow, and R. S. Kirk

R/D NEEDS FOR AIR POLLUTION INSTRUMENTATION.

Preprint, Air Pollution Control Assoc. Pittsburgh, Pa., 14p., 1970. (Presented at the Air Pollution Control Association Annual Meeting, 63rd, St. Louis, Mo., June 14-18, 1970, Paper 70-103.)

An outline of research and development needs is presented, based on the difference between the instrumentation needs noted and the present state-of-the-art, as defined by available instruments and complete research and development programs. There are a number of instances where satisfactory instrumentation is not available for standards which have already been set or are expected in the immediate future. Examples of this are particulates in auto exhaust, continuous measurements of nitric oxide in stacks, and continuous monitoring for very low ambient levels of total oxidants. Data are needed to help define new or modified criteria where instruments to make the necessary measurement are not fully developed. One example is respirable particles, particularly in the submicron size range, and another is the pollens present as aeroallergens. A third category is the improvement of instruments presently available. Instruments for remote stack measurements will be of value, while standard systems for moving source measurements are a prime requirement. A general need also exists for standard reference methods and instrument equivalence testing. Solid adsorbent collectors offer advantages over liquid bubblers for routine ambient measurements. Many instruments can be multi-component analyzers, which consider the pollutant system as a whole. The most commonly measured pollutants are all related to combustion, and these are more likely to require continuous measurement on a large scale than other pollutants which are largely spot hazards. (Author abstract modified)

10099

APTIC NO. 27712

Ensor, David S. and Michael J. Pilat

CALCULATION OF SMOKE PLUME OPACITY FROM
PARTICULATE AIR POLLUTANT PROPERTIES.

Preprint, Air Pollution Control Assoc., Pittsburgh, Pa., 22p., 1970. 36 refs. (Presented at the Air Pollution Control Association Annual Meeting, 63rd, St. Louis, Mo., June 14-18, 1970, Paper 70-83.)

A general theoretical relationship between plume opacity and particle properties is developed and compared with experimental data and numerical results are presented to include the ranges of physical properties expected for air pollutants (e.g., aluminum, zinc, and iron oxides, sulfuric acid, carbon, and benzene). Calculation of smoke plume opacity from the properties of the particulate emission is facilitated with the use of a parameter K (specific particulate volume extinction coefficient per m) computed from theory; K is primarily a function of particle size for particle radii greater than about 0.5 micron and primarily a function of refractive index for smaller particles. Graphs of K vs. the geometric mass mean particle radius at geometric standard deviations from 1 (monodisperse) to 10 are presented for particle refractive indices of 1.96-66i (carbon), 2.80-.02i, 1.33 (water) and 1.50 at a wavelength of light of 550 nm. Experimental data of K for various industrial emission sources are reported. Application to Ringelmann number evaluations is discussed and illustrated with an example. (Author abstract modified)

10100

10100

APTIC NO. 27713

Homolya, James B., Joseph P. Backman, and Ronald H. Duckstein

SURVEYING AIR QUALITY AROUND PETROLEUM REFINERIES.

Preprint, Air Pollution Control Assoc., Pittsburgh, Pa., 19p., 4 refs. (Presented at the Air Pollution Control Association, Annual Meeting, 63rd, St. Louis, Mo., June 14-18, 1970, Paper 70-121.)

A mobile laboratory was designed and constructed to assess the air quality in and around petroleum refineries. The van houses a complete power-generating system, air-conditioning, and laboratory working space. Several pollutants are monitored continuously, including sulfur dioxide, hydrogen sulfide, ozone, carbon monoxide, oxides of nitrogen, hydrocarbons, and particulate matter. The van also contains a gas chromatograph for detailed hydrocarbon analyses and tracer studies, a novel in-the-field calibration system, and suitable equipment for performing standard wet-chemical analyses as back-up methods for the continuous analyzers, as well as instrumentation for the continuous recording of wind speed, wind direction, air temperature, dew point temperature, and solar radiation intensity. For a typical survey, several monitoring sites are chosen around the periphery of the refinery. Locations of these sites are based on projected ground level concentrations of pollutants obtained from a computerized dispersion model using the Sutton Equation. The van is then moved from site to site for two-hour periods during the day and left unattended at an additional site at night. This procedure is followed daily until sufficient monitoring data have been obtained under a wide range of meteorological conditions. Several statistical techniques, involving correlation of contaminant levels with existing weather parameters, are used in the analyses of the data to pinpoint sources of pollution and to geographically describe the area affected by each source. A digital data acquisition system provides computerized processing and storage of the monitoring data. (Author abstract modified)

10101

APTIC NO. 27716

Dams, R., K. A. Rahn, and J. W. Winchester

SAMPLING AEROSOLS FOR NONDESTRUCTIVE NEUTRON ACTIVATION ANALYSIS.

In: I. Occurrence of Halogens in Atmospheric Aerosols and Precipitation. II. Air Pollution Inputs of Trace Metals to Lake Michigan Water. Michigan Univ., Ann Arbor, Dept. of Meteorology and Oceanography and Michigan Univ., Ann Arbor, Great Lakes Research Div., AEC Contract AT(11-1)-1705, ORA Proj. 08903, PR-3, 17p., May 1970. 6 refs.

Ten filter materials were tested for suitability for atmospheric particulate sampling and elemental analysis by nondestructive neutron activation using germanium (lithium) gamma-ray spectroscopy. Trace element contents in most materials are high and are often the principal limitation in analytical sensitivity. Of the commercially available filters tested, Whatman 41 cellulose has the lowest analytical blanks but may clog during prolonged sampling. For some elements Millipore membrane filters have low blanks but tend to disintegrate during neutron irradiation. Polystyrene fiber filters appear to be the most suitable if they could be made available from commercial suppliers with uniformly low blank levels. (Author abstract)

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APTIC NO. 27717

Oblanas, John W. and Ronald T. H. Collis

LIDAR OBSERVATIONS OF THE PRE-GONDOLA I CLOUDS. FINAL REPORT.

Stanford Research Inst., Menlo Park, Calif. Contract AT (04-3), 115, Proj. 66, SRI Proj. 6286, 77p., Jan. 1967.

NTIS: PNE-1110

A Mark V neodymium lidar system was used to study the clouds produced by nitromethane cratering explosions near Fort Peck Reservoir, Montana, in October 1966. The lidar system demonstrated its general capability for providing information on cloud dimension height, volume, density, and rate of growth. Lidar echoes were obtained even when clouds became too diffuse to be visible. In general, lidar observations provide information on the position of such echoes in three dimensions, with sufficient resolutions in space and time to determine the position, lateral and vertical extent, and volume of the cloud. Successive observations then readily provide information on the clouds rate of growth and motion. Recommendations are made for improving the ultimate capability for monitoring dust clouds caused by large-scale chemical explosions.

10103

APTIC NO. 27728

Shimp, G. Jeffrey

THE APPLICATION OF THIN LAYER CHROMATOGRAPHY TO THE ANALYSIS OF PARTICULATE ATMOSPHERIC POLLUTANTS FOR THE PRESENCE OF CARCINOGENIC COMPOUNDS.

Dust Topics, 4(4):5, 12, 1967. 18 refs.

Airborne particulates can be analyzed rapidly for the presence of various carcinogenic compounds using thin layer chromatographic separations followed by a variety of spectrophotometric identifications. A sample or airborne particulates is collected by passing a suitable quantity of air through an efficient filter which is then subjected to extraction, usually by benzene. The extract, containing a multitude of organic compounds, is concentrated and a small portion of it is spotted on a thin-layer glass plate. No time or compound is lost in the process of extraction or elution as it is possible to analyze the chromatographic spots spectrophotometrically without removing the compound from the plate. Disadvantages include an increased interference from the spectral scatter peak, shortened lifetime of the phototube, and difficulty in obtaining spectra of the salts of weak bases. Quenchofluorometric techniques can be applied to the thin-layer plate to eliminate interference and improve sensitivity. This method can be adopted for work with any chosen group of compounds, such as polynuclear aromatic hydrocarbons, aza heterocyclics, and polynuclear ring carbonyl compounds. A method is described for the assay of 9-acridanone in urban atmospheres.

10104

APTIC NO. 27729

Groth, Richard H. and Daniel S. Calabro

EVALUATION OF THREE WET CHEMICAL METHODS FOR DETERMINING SO₂ IN TURBINE EXHAUST GASES.

Preprint, Air Pollution Control Assoc., Pittsburgh, Pa., 20p., 1970. 6 refs. (Presented at the Air Pollution Control Association Annual Meeting, 63rd, St. Louis, Mo., June 14-18, 1970, Paper 70-32.)

Several wet chemical colorimetric methods have been used or suggested for the determination of sulfur dioxide concentrations in air pollution work. These include the Stephens-Lind-

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strom method, the Scaringelli-modified West-Gaeke method, and the Schulze method. A laboratory study to evaluate the usefulness of these procedures is described. It is directed to individuals concerned with the analysis of gases from the exhaust of gas turbine engines and other combustion processes, including stationary power plants. The variables considered were range of usefulness in terms of concentration of SO₂, efficiency of collection, effect of contaminants, specifically oxides of nitrogen, olefin and aldehyde, and effect of storage prior to spectrophotometric measurement. The Stephens-Lindstrom method was the most suitable for measuring higher levels of SO₂ concentrations. It can accurately measure amounts totalling 600 micro-liters and above whereas the other methods were limited to practical levels of about 28 micro-liters for the Scaringelli and 50 micro-liters for the Schulze methods, respectively. Collection efficiencies were satisfactory for all methods with minor changes in equipment or procedure. Contaminants, particularly oxides of nitrogen, produce interference errors in all three methods but are a problem only at low levels of SO₂ in the Stephens-Lindstrom method. In the Stephens-Lindstrom method, temperature control during SO₂ addition is necessary. Storage of exposed reagents prior to measurement produce only small errors if stored at 0 C, for the Stephens-Lindstrom method, room temperature storage is also satisfactory. (Author abstract modified)

10105

APTIC NO. 27731

Sawicki, Feliks, Zdzisław Krzyzewski, Zbigniew Wojtowicz, Jozef Trendota, and Lucyna Milewska

CHRONIC NONSPECIFIC RESPIRATORY DISEASES IN THE CITY OF CRACOW. X. STATISTICAL ANALYSIS OF AIR POLLUTION BY SUSPENDED PARTICULATE MATTER AND SULFUR DIOXIDE.

Epidemiol. Rev., 23(3-4):221-231, 1969. 1 ref.

The statistical analyses conducted of particulate and sulfur dioxide sampling programs in Cracow, Poland, are described, as part of a study of pollution-related respiratory disease in that city. From 1966, measurements of these pollutants were made with a continuous air sampling apparatus modified from the English Warren Spring Laboratory design at a series of sites around the city; from 1959-1965 they had been measured by dustfall and the lead peroxide candle methods. A method for comparative analysis of high and low polluted areas is described, as well as the one-way and two-way variance analyses employed for comparing results of continuous measurements from different sites. One-way variance was selected for final evaluation of areas with high and low pollution since it was found to be much less time-consuming, especially when some measurements are lacking from instrument defects. The results obtained by the post-1966 and pre-1966 measurement methods were also compared; the earlier methods proved unsuitable for use in the present survey for ranking areas according to degree of pollution. The areas with the highest air pollution were the midtown district and some of the regions in the Vistula river valley. These data will be utilized in analyzing results of the health survey.

10106

APTIC NO. 27733

London, Sheldon A., Wilbur M. Sappington, and Barry W. Widman

EVALUATION OF FIELD INSTRUMENTATION FOR N₂O₄ AND MONOMETHYLHYDRAZINE.

Aerospace Medical Research Lab., Wright-Patterson AFB, Ohio, Medical Div., Conference on Atmospheric Contamina-

tion in Confined Spaces, 5th Annual, Dayton, Ohio, 1969, p. 341-362. 23 refs. (Sept. 16-28, Paper 25.)

NTIS, DDC: AD 709994

The past and present effort to develop monitoring instrumentation for liquid missile propellant operations, particularly systems of monomethylhydrazine (MMH) and nitrogen dioxide/nitrogen tetroxide, is considered. Currently available colorimetric and physico-chemical methods are reviewed, and a detailed account is given of evaluation studies of a commercially manufactured portable detector, the Olfactron Model 6110, which were conducted to determine its sensitivity and linearity of response to MMH, to ascertain the validity of MMH calibration using UDMH, and to determine the performance of a new NO₂ transducer. Review of the literature and results of the present studies indicate little success in developing the desired instrument; none of the devices tested fulfilled field requirements for MMH and NO₂ monitoring. Field calibration of the Olfactron with UDMH for MMH detection was not accomplished as designated by the manufacturer, and the reproducibility of the estimation of repeated exposures was limited to short term events unacceptable for operational situations. Emphasis should therefore still be placed on colorimetric methods of proven reliability. In conjunction with previously demonstrated sensitivity of olfactory detection (odor thresholds of less than 0.5 ppm for NO₂ and less than 0.3 ppm for UDMH), colorimetric tubes can provide useful information until instruments and dosimeters are developed that have the required reliability.

10107

APTIC NO. 27735

McKee, Herbert C.

INSTRUMENTAL METHOD SUBSTITUTES FOR VISUAL ESTIMATION OF EQUIVALENT OPACITY.

Preprint, Air Pollution Control Assoc., Pittsburgh, Pa., 24p., 1970. 6 refs. (Presented at the Air Pollution Control Association, Annual Meeting 63rd, St. Louis, Mo., June 14-18, 1970, Paper 70-84.)

A method developed by the Texas Air Control Board as an alternative to the 'equivalent opacity' concept utilizes an instrument to measure the optical properties of an emission in order to determine compliance with regulations. A commercial light-scattering instrument is installed in a duct or stack where the optical properties of the gas stream can be measured prior to leaving the stack, thus obtaining a continuous record of optical transmittance. The regulation provides that the light source emit spectral energy approximately equivalent to normal daylight, with no more than 10% of the total energy in the region of the spectrum above two micron wave length. A calibration procedure developed to permit use of the method as a legal basis for regulation and control is described, and precautions and an illustrative example are given. The instrumental method has several advantages over visual observations by inspectors: it is completely objective, has superior accuracy and reproducibility, can be used at all times independent of sunlight, cloud cover, darkness, or poor weather; produces continuous automatic records at far lower costs than those for frequent visual observations; and can be used as a means of process control for continuous processes. Consideration is being given to making the instrumental method mandatory for all industries subject to regulation on the basis of opacity excluding only those below some minimum size.

10106

APTIC NO. 27746

Saffiotti, Umberto, Francesco Cefis, and Leonard H. Kolb

A METHOD FOR THE EXPERIMENTAL INDUCTION OF BRONCHOGENIC CARCINOMA.

Cancer Res., vol. 28:104-124, Jan. 1968. 55 refs.

A methodology for the experimental induction of bronchogenic carcinoma in conditions related to those of human exposure to respiratory carcinogens is described. Animal of choice is the hamster. Polynuclear hydrocarbon carcinogens are prepared as suspensions of fine crystalline particles and attached to a finely particulated inert dust which acts as a carrier; the mixed dust is suspended in saline and administered by intratracheal instillation. Penetration and distribution patterns are described. No necrosis and no chronic inflammatory reactions other than phagocytosis are induced. Repeated intratracheal instillations of benzo(a)pyrene with hematite dust induce up to 100% incidences of respiratory tract tumors, most bronchogenic carcinomas. The morphology of these tumors appears very close to that of human lung cancer; squamous cell carcinomas are the most frequent type followed by anaplastic carcinomas and by a few adenocarcinomas. The experimental model presented here appears adequate for studies on factors involved in the pathogenesis of cancer of the lung. (Author summary)

10109

APTIC NO. 27749

Spurny, K.

MEMBRANE FILTERS IN AEROSOLGY I. THE STRUCTURE OF MEMBRANE FILTERS.

(*Membranfilter in der Aerosologie I. Zur Struktur der Membranfilter*). Text in German. *Zentr. Aerosol-Forsch. (Stuttgart)*, 12(5):369-407, Sept. 1965. 63 refs.

The concepts of filter, filtration, ultrafilter, and ultrafiltration are defined, as well as the preparation of cellulose nitrate membrane filters (gelatinizing of cellulose nitrate solutions, effect of solvents, diluents and of precipitants, laboratory and industrial preparatory methods) and the structure of membrane filters (porosity and its determination, determination of size, dispersion of pores, and membrane filter models), and equations expressing the gas flow through the porous medium of a membrane filter are discussed. A membrane filter is formed by gelatinizing colloid solutions. The resulting gel yields after drying porous xerogel which is sufficiently strong and stable in air and represents a complete analytical filter or ultrafilter of aerodisperse systems. Membrane filters can be made from solutions of natural macromolecular substances (cellulose derivatives) and from solutions of artificial macromolecular substances. The properties of a membrane filter are given by its structure, that is by the surface distribution of pores, by the arrangement of the porous volume, by the size and form of the vacuoles, and by other factors. The physical values characterizing the structural characteristics of a membrane filter are true magnitudes and fictional magnitudes representing the properties of a certain model which possesses some characteristics identical with those of a real filter. Pore distribution is determined by mercury porosimetry and by electron microscopy.

10110

APTIC NO. 27757

Ayer, Howard E. and Bernard E. Saltzman

NOTES ON INTERFERENCES BY OXIDES OF NITROGEN WITH ESTIMATIONS OF CARBON MONOXIDE IN AIR BY THE NBS INDICATING TUBES.

Am. Ind. Hyg. Assoc. J., vol. 20:337-339, Aug. 1959. 9 refs.

Nitrogen dioxide and nitric oxide interference with carbon monoxide estimations by the National Bureau of Standards indicating tube, suitable for use in determining CO in diesel fumes, were investigated. Both oxides interfered seriously, the nitrogen dioxide to a greater extent. Nitrogen dioxide interference can be eliminated and nitric oxide interference considerably reduced by using a U-tube with solid potassium permanganate in the upstream leg and Ascarite in the downstream leg. The U-tube is flushed with the contaminated air, using the rubber bulb, and then connected ahead of the indicating tube. The field determination of carbon monoxide is then made in the usual way. No interference may be expected from concentrations of nitrogen oxides up to 15% of that of carbon monoxide. If an NBS tube estimation without the U-tube does not give a color lighter than one made with the tube, then nitrogen dioxide can be presumed to be within its threshold limit of five ppm. (Author summary modified)

10111

APTIC NO. 27791

Ohira, Toshio

PRESENT STATE AND FUTURE COURSE OF RESEARCH ON OFFENSIVE ODOR, A PUBLIC NUISANCE.

(*Akushu kogi kenkyu no genjo oyobi hoko*). Text in Japanese. Tokyo-to Kogi Kenkyusho-ho (Tokyo Public Nuisance Res. Inst. Bull.), no. 1-3-2:1-31, March 1970.

Studies of offensive odors undertaken by the Research Institute of the Tokyo Metropolitan Government, begun in 1966 are reviewed. The Institute has been concentrating on studying the offensive odor generated in fish intestines and bone disposal plants. In 1966, the offensive odor was analyzed by gas chromatography. A gas chromatographic analysis of the offensive odor to determine amines was made in a field experiment at fish waste disposal plants. Only ammonia and trimethyl amine were detected in this analysis, conducted in 1967, perhaps because of improper sampling and pretreatment of the sample. In 1968, three types of commercially available deodorizers were tested for deodorization of the fish wastes: the ozone oxidation type (water washing-ozone addition-active carbon adsorption), venturi scrubber type, and the sulfonic carbon adsorption type. The results obtained were tabulated by type. An extracted-juice concentrator was also tested with a view toward recovering and deodorizing the useful contents. The device consisted of a juice storage tank, a separator (protein, fat, and solids), a high-speed centrifugal separator (protein separation) and vacuum concentrator (protein concentration). Among the main objectives of the 1970 study were improvement of sampling method, upgrading of gas chromatographic analysis precision (on low amine compounds and low sulfides) and comparison of three types of sense tests (non-odor chamber method, injector method, and Kinoshita method). Intermediate results of the experiments and tests were tabulated. Some of the outstanding problems that have to be solved as soon as possible include standardizing sampling methods for obtaining odorous test samples, analyzing undetermined contents contained in an offensive odor by gas/mass analyzer or through synthesization of odorous substances unobtainable commercially, and making available more complete sets of measuring instruments.

10112

APTIC NO. 27807

Williams, David T.

PORTABLE SPECTROMETRIC ANALYZER FOR AIR POLLUTION. (FINAL REPORT). Florida Univ., Gainesville, Research Grant AP 00591, 86p., Dec. 22, 1970. 16 refs.

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A comprehensive description, and theoretical analysis, are given for a 'derivative' spectrometer which detects each line of each pollutant absorbing gas as the derivative of the intensity wavelength spectrum. The instrument is built around a conventional spectrometer modified so that radiation leaving the exit slit varies sinusoidally in wavelength frequency about a middle wavelength; the portion of the signal varying with twice the frequency can be separately amplified in a tuned amplifier, and thereafter measured. The wavelength modulation is accomplished by a single oscillating entrance slit. The physical property of pollutants that is detected is the ultraviolet or visible absorption spectrum characteristic of the molecular gas under study. The ability of the instrument to detect prime urban pollutants under field conditions has been successfully demonstrated, as has its ability to determine accurately blood ammonia.

10113

APTIC NO. 27813

Stenger, Ralph L., Jr.

THE ANALYSIS OF COAL ASH, FLYASH AND RELATED MATERIALS USING THE APPLIED RESEARCH LABORATORIES SPECTROGRAPHIC ANALYZER-COMPUTER ASSISTED DATA REDUCTION.

Preprint, 38p., 1969. 12 refs. (Presented at the Pittsburgh Conference on Analytical Chemistry and Applied Spectroscopy.)

A low-cost emission spectrograph was successfully employed to analyze fly ash and coal samples where a conventional installation (large spectrograph, multisource excitation, desitometer, special photographing processing equipment) could not be justified. Nearly 500 samples were analyzed for silicon, aluminum, iron, titanium, calcium, and magnesium at an estimated savings of about \$20 per sample, compared to wet gravimetric methods. Spectra are excited by an overdamped direct current discharge between graphite electrodes. The sample, mixed with graphite and strontium carbonate, is contained in the lower electrode cavity. A rotating logarithmic sector, placed in front of the spectrograph slit, attenuates the analytical and internal standard lines to the same intensity at some point along the slit. Log intensity ratios are determined visually by optical density matching; concentrations are obtained from analytical curves relating log intensity ratio to log concentration. Computer-assisted data reduction speeds calculations. Accuracy of the procedure is plus or minus 9% of the amount present, or better.

10114

APTIC NO. 27822

Adams, R. E. and R. J. Davis

ATMOSPHERIC PRESSURE SAMPLERS FOR SIZING PARTICULATE AEROSOLS.

In: *Reactor Chemistry Division Annual Progress Report*. Oak Ridge National Lab., Tenn., Reactor Chemistry Div., Contract W-7405-eng-26, Rept. ORNL-4229, p. 157-158, March 1968. 1 ref.

Two instruments under development are briefly described to fill the need for simple, remotely operable aerosol sampling and sizing equipment capable of operation under the environmental conditions of large containment vessel experiments. A fibrous filter analyzer characterizes the aerosol in terms of its response to filtration processes by developing an aerosol distribution as a function of depth in an expanded filter under carefully controlled conditions. The second device, a four-stage inertial impactor sampler, has cutoff points of 2.6, 1.1, 0.4, and 0.16 microns diameter at a sampling rate of 6.25 l/min and particle density of 4 g/cu cm. The impactor provides im-

proved sharpness of particle fractionation compared with commercial impactors, and facilitates possible remote disassembly. Testing programs are in progress for both instruments.

10115

APTIC NO. 27829

Honma, K.

SAMPLING OF HEAVY METAL FUMES BY FILTRATION.

(*Jukinzoku Iyumu no rokasho*). Text in Japanese. Preprint, Japan Society for Safety Engineering, Tokyo, 2p., 1970. (Presented at the National Symposium on Safety Engineering 1st, Tokyo, Japan, May 1970.)

Lead was chosen as the model for Uranium and Plutonium in testing the filtration capturing of radioactive heavy metal aerosols in order to confirm applicability of the results evaluated by 0.3 micron DOP. Collection rate was measured for various types of filters with textile-loaded layers by generating standard monodisperse aerosols of metallic lead. The filtration mechanism was studied for heavy metallic fumes in the low wind-velocity range. The monodisperse aerosol generator was a high-frequency induction heating type using nitrogen gas as carrier, and the aerosol sizes ranged from 0.05 to 0.7 micron. Even at a low wind velocity range, the effect of the specific weight of aerosols became obvious beyond 0.3 micron. For lead fumes, the finer the filter fibers and the faster the filtration wind velocity, the smaller the minimum particle size for capture.

10116

APTIC NO. 27838

Kito, Toshimasa

MEASUREMENT OF LEAD IN AIR DUST BY POLAROGRAPHY.

Text in Japanese. *Igaku Kenkyu (Acta Med.)*, vol. 25:1289-1308, 1953. 12 refs.

A new method of determining lead in air dust by polarography was devised. With a Jet Dust-counter (Roken Dust-counter) 50-1000 cc of air is drawn and lead dust is precipitated on the cover glass, dissolved in pure 2N nitric acid, evaporated and dried. Then it is dissolved in 2.0 ml of a supporting electrolyte and measured by polarography. The air containing lead dust is sucked through 75.0 ml of purified water in an impinger. To 50.0 ml of it, 10 ml of pure concentrated HNO₃ is added, evaporated and dried. Dissolving it in a supporting electrolyte, the lead is measured by polarography. If any other inorganic matter affecting the polarogram is mixed in the dust, it can easily be measured by it simultaneously. As the maximum suppressor of Pb, glycochloric acid was most suitable. The supporting electrolyte, 0.1N Potassium nitrate, containing glycochloric acid (Merck) 0.1% and 0.1N HNO₃ 3.5%, pH 3.0, was most adequate. The low Pb wave was observed in the range of pH 5-10. The diffusion current of Pb increased by 1.45% as the temperature of the electrolyte rose by 1.0 C.

10117

APTIC NO. 27845

Henderson, J. S.

AIR POLLUTION CONTROL: AMBIENT AIR SAMPLING.

Text. *Ind. (Atlanta)*, 135(3):69, 71, 73, 75, 77, March 1971. 19 refs.

Descriptions are given of sampling instruments for the following pollution parameters: suspended particulate, settled particulate, windblown particulate, coefficient of haze, sulfur dioxide, sulfation, and weather, i.e., wind speed and direction. Capital and operating costs are summarized for the instrument

group, and sampling applications are discussed. Ways in which sampling costs can be minimized are indicated.

10118

APTIC NO. 27848

Woodhouse, E. J. and T. H. Norris

COMPLEX FORMATION BETWEEN SULFUR DIOXIDE AND HALIDE IONS IN ACETONITRILE SOLUTION.

Inorg. Chem., 10(3):614-619, 1971. 42 refs. (Presented at the International Conference on Non-Aqueous Solvent Chemistry, McMaster Univ., Hamilton, Ontario, June 1967.)

The ultraviolet visible absorption spectra of mixtures of sulfur dioxide and tetraethylammonium chloride, bromide, or iodide in acetonitrile solution showed strong bands at 294, 321, and 378 nm, respectively. These occurred toward longer wavelengths relative to the halide ion absorptions and were much stronger than the SO₂ band at 282 nm. On the assumption that these bands correspond to the halide-SO₂ complex formation, the stoichiometries of the complexes were investigated by Job's method of continuous variation. Results clearly indicate maximum absorbances in all three cases at 1:1 halide:SO₂ mole ratios. A linear correlation between absorption frequency and halide ionization potential is observed. Molar extinction constants and formation constants were obtained.

10119

APTIC NO. 27852

Ohzeki, Kunio and Tomihito Kambara

A NEW COLUMN PACKING FOR THE SEPARATION OF CARBON MONO- AND DIOXIDE.

J. Chromatog., 55(2):319-323, March 1971. 3 refs.

The nickel form of Amberlyst 15, a sulfonic acid cation exchanger, was packed in a gas chromatographic column and the column reduced at 180 C by hydrogen flowing at a rate of 150 ml/min. After the reduction, the column effectively separated both carbon monoxide and carbon dioxide from air. The separation power of the column is weakened by moisture but is easily restored by activating the column in a flow of hydrogen for 2-3 hrs. The properties of the column are discussed.

10120

APTIC NO. 27855

Khorguani, V. G., G. V. Stepanov, and S. L. Sarkisov

GROUND-OPERATED AND AIRBORNE CONDENSATION TRAPS OF THE IMPACT TYPE FOR INVESTIGATIONS OF AEROSOLS.

Bull. Acad. Sci. USSR, Phys. Atmos Oceans (English translation from Russian of: Izv. Akad. Nauk SSSR, Fiz. Atmosfery i Okeana), 6(7):434-436, July 1970. 6 refs.

Two impact-type traps, one ground-operated and one airborne, were built to study both natural aerosols present in low concentrations at high altitudes and dense artificial dusts. The traps have a high efficiency for precipitating particles up to 0.02 microns. Their design allows rapid sample taking and makes it possible to study fluctuations of microphysical aerosol parameters in the atmosphere and in the laboratory. The operating principle of the instruments is inertia-induced deposition of aerosol particles from a jet impinging on a plane obstacle. The outflow of the gas from the nozzle occurs at the critical velocity and the outflow velocity is equal to the local velocity of sound. The design and operation of the impact traps are discussed and test results are presented for silver iodide and sodium chloride aerosols.

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10121

APTIC NO. 27861

Yanagihara, Shigeru

PHOTOCHEMICAL REACTIONS OF AUTOMOBILE EXHAUST.

(*Jidosha haiki gasu no kokagaku hanna*). Text in Japanese. Nippon Kikai Gakkai-shi (J. Japan Soc. Mech. Engrs.), Tokyo, 74(626):228-233, March 1971. 5 refs.

A smog chamber patterned after that used by the U. S. Department of Health, Education and Welfare is described, together with some irradiation experiments. The chamber has a volume of 11 cu m and is equipped with 300 40W fluorescent lamps. The ultraviolet light irradiated has an energy peak at 3500 Å. A nondispersive infrared analyzer is employed for the continuous analysis of carbon monoxide, carbon dioxide, n-hexane, nitric oxide, and other gases. Diluted and irradiated automobile exhaust is analyzed for carbon monoxide, hydrocarbons, nitrogen dioxide, nitric oxide plus nitrogen dioxide, oxidant, and sulfur dioxide. Portable analyzers employed include a coulometric-type ozone meter and an electrochemical cell for nitrogen oxides. Gas chromatographic, infrared spectrophotometric, or mass spectrographic analyses are also performed. Formaldehyde is quantitatively analyzed every 30 min by the pararosaniline method. Irradiation experiments on automobile exhaust revealed that the rate of the photochemical reaction is controlled by the initial ratio of hydrocarbons to nitrogen oxides, while the maximum oxidant value depends on hydrocarbons and nitrogen oxide concentrations. Effects of irradiation intensity and temperature are described, as is the reactivity of hydrocarbons. Differences between Los Angeles and Tokyo photochemical smog are pointed out.

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APTIC NO. 27867

Odaira, Toshio

AIR POLLUTION AND ITS SURVEILLANCE.

(*Taiki osen to sono kanshi taisai*). Text in Japanese. Kagaku Kagaku (Chem. Eng.), 35(1): 7-13, 1971. 7 refs.

Human society can be regarded as subject to material metabolism. From this point of view, the natural resources of air, water, soil and solar energy are finite resources belonging to all mankind. Since petroleum became the major source of energy, the processes of resource exploitation and synthesis-production have grown remarkably, while the processes of resolution and evacuation have been disregarded. This has retarded the growth of the resolution-reproduction industries which were to reclaim air and water-pollutants and materials discharged from the processes of synthesis-production, utilization, and abandonment. And as a result, the amount of man-made pollutants outran the natural purification ability, causing the present pollution of air, water, and soil. Topics discussed include the definition and the effects of air pollution. The phenomenon of air pollution is influenced considerably by the activeness of sources and weather conditions, so an understanding of the interaction between these factors is the first step in pollution control. Tables are presented for amounts of carbon monoxide, sulfur dioxide, hydrocarbons, particulates, nitric oxide, and nitrogen dioxide emitted and measured by various air monitoring networks, as well as methods used.

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APTIC NO. 27959

Aichi Prefectural Government (Japan), Pollution Countermeasure Bureau

DATA CONCERNING POLLUTIONS.

(*Kogai ni kansuru shiryo*). Text in Japanese. 47p., Nov. 1970.

Data on the following subjects are compiled in tabular form: a dispute over pollution involving fishermen and others in Tokkaichi City vs pulp and paper mills and extending back to 1953; economic indicators of Japan's rapid economic growth; environmental standards; and measurements of noise, water, and air pollution in Aichi Prefecture. Such surveys are conducted on a continuous basis and were recently strengthened by the establishment of the Aichi Prefectural Pollution Research Center. A telemeter monitoring network involving the cities of Nagoya, Tokai, and Chita consists of 56 sensors for dust fall, 11 for floating dust, 358 for sulfur oxides; 3 for carbon monoxide, 2 for nitrogen oxides, 81 for river pollution, and 525 for noise. An air pollution forecasting system based on a survey of meteorological data will be employed to reduce air pollution from an area recently zoned for industrial use. In addition, the prefectural government is making loans available to industry, at low or no interest, to defray the cost of modern control facilities.

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APTIC NO. 20377

Zhilin, P. N.

ATMOSPHERIC AIR POLLUTION IN LITHUANIAN CITIES.

U.S.S.R. Literature on Air Pollution and Related Occupational Diseases, vol. 8: 174-179, 1963. (B. S. Levine, ed.)

CFSTI: 63-11570

The results of a series of air quality measurements made over a period of years in the cities of Vilna, Kaunas, and Klaipeda are reported. Two electric heat and power stations and a number of manufacturing plants were found to be the chief sources of pollution in the Lithuanian SSR, as determined by dust measurements. Children living in the vicinity of one of the power plants were examined in 1952 for respiratory effects from pollution; the resulting morbidity data showed that influenza, adenoids, pulmonary tuberculosis, and pneumonia occurred most frequently among children living in the areas of greatest air pollution. It is recommended that dust collectors be installed at coal and steam-operated electric stations and that two large power plants and most smaller domestic and industrial buildings convert to gas burning. In addition, the cellulose paper plant in Klaipeda should take steps to reduce sulfur dioxide emissions, some changeover to electric transportation systems should take place, and certain industrial plants should be moved to locations away from populated areas. Inspection and reporting stations are needed to achieve greater pollution control.

10125

APTIC NO. 21103

Stratmann, H.

FIELD EXPERIMENTS TO DETERMINE THE EFFECTS OF SO₂ ON VEGETATION. PART II: MEASUREMENT AND EVALUATION OF SO₂ GROUND LEVEL CONCENTRATIONS.

(Freilandversuche zur Ermittlung von Schwefeldioxydwirkungen auf die Vegetation. Part II: Messung und Bewertung der SO₂-Immissionen). Forschungsber. Landes Nordrhein-Westfalen, no. 1184, 69p., 1963. 19 refs. Translated from German. CEGB Information Services, London (England), 58p.

As part of a project to determine levels of sulfur dioxide safe for plants, six stations were established in the vicinity of an iron mine and stocked with agricultural and silvicultural plants.

Sulfur dioxide concentrations were measured continuously with an electroconductivity analyzer. The calculations required to identify constantly varying ground level concentrations in terms of parameters defining mean concentration, concentration-time-integral, variations in concentration, frequency of recovery periods, and frequency of concentration peaks are described. Because of their importance in relation to the onset of pollution effects, five weighting factors were formed from the individual parameters which characterized the pollution conditions. These in turn were reduced to a single degree of hazard comprising those parameters most important to characterize pollution with respect to its effects on plant response. The mathematical/statistical analysis of the degrees of hazard indicated that with this characterization, the pollution conditions at the individual experimental stations could be differentiated. Although the components of the hazard from SO₂ can be characterized by means of the degree of hazard, it is not yet possible to draw definite conclusions about the onset of damage to the plant from the degree of hazard. The data from the extensive statistical analyses of SO₂ measurements at the six stations are presented. (Author conclusions modified)

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APTIC NO. 21130

National Air Pollution Control Administration, Raleigh, N. C., Div. of Air Quality and Emission Data

1969 DATA TABULATIONS AND SUMMARIES. CONTINUOUS AIR MONITORING PROJECTS. NATIONAL AIR SURVEILLANCE NETWORKS. CHICAGO.

NAPCA Pub. APTD 69-15, 103p., Dec. 1969.

One of the Continuous Air Monitoring Projects of the National Air Surveillance Networks is to routinely operate continuous monitoring stations in six major cities, including Chicago. The data tabulations in this report consist of hourly average concentrations of six gaseous pollutants and 2-hr measurements of soiling index levels in Chicago during 1968. The pollutants are carbon monoxide, nitric oxide, nitrogen dioxide, sulfur dioxide, total hydrocarbons, and total oxidants. A brief summary of monthly means and maximums and graphs of seasonal diurnal patterns of the pollutants are included. (Author abstract modified)

10127

APTIC NO. 21219

Terabe, M. and M. Nagata

COMPARATIVE STUDY ON MEASUREMENTS OF SUSPENDED PARTICULATE MATTER USING THE FOUR KINDS OF SAMPLERS.

Kuki Seijo (Clean Air - J. Japan Air Cleaning Assoc., Tokyo), 7(3):9-15, 1969. 12 refs. Translated from Japanese. Belov and Associates, Denver, Colo., 14 p., April 26, 1970.

The Cyclone-Hi-Volume Sampler, the High Volume Sampler, the Tape Sampler, and Digital Indicator were used to measure the suspended particulate matter in the surface air over Hawasaki City, Japan, between July 1968 and January 1969. Factors measured were as follows: total dust, respirable dust (less than 3.3 micron diameter), soiling index, and counts per hour (cph) as measured on a digital analyzer. Correlations were made among the results obtained. A high degree of relationship was observed among the results from the first three systems, but the digital analyzer showed poor correlation. This was attributed to the deposition of particles on the wall of the sampling duct. The increase in dust density observed in the winter readings is attributed to heating requirements superimposed upon the continuing industrial fuel burning requirements.

10128

APTIC NO. 21239

Dikun, P. P. and I. I. Nikberg

INVESTIGATION OF ATMOSPHERIC POLLUTION WITH 3:4-BENZOPYRENE IN THE VICINITY OF PITCH-COKE OVENS OF OBSOLETE PATTERN.

Probl. Oncol. (USSR) (English Translation from Russian of: Vopr. Onkol.), 4(6): 32-38, June 1958. 6 refs.

The results of an analysis of three sets of samples taken from the vicinity of an obsolete pitch-coke oven, at various times, at various distances from the works, and at points lying at various directions away from it are given. The first series were of deposits of dusts; the second series were of sedimentation samples; and the third series were of aspiration samples. The analysis of all three samples showed that exceptionally large amounts of carcinogenic hydrocarbons, in particular 3,4-benzopyrene, escaped into the surrounding area. Subsequently, on special government instructions aimed at ensuring a healthy atmosphere, the coke ovens were equipped with special devices to provide additional combustion of exhaust gases. Analysis showed that after reconstruction of the coke ovens, atmospheric pollution in the vicinity of the pitch-coke works sharply diminished.

10129

APTIC NO. 27718

DATA FROM THE AIR POLLUTION MEASUREMENT CAMPAIGNS AT 'ELECTRICITE DE FRANCE' THERMOELECTRIC PLANTS IN 1969; PART II. MEASUREMENTS WITH S.F. EQUIPMENT.

(Resultats des campagnes de mesure de la pollution atmospherique sur le site des centrales thermiques E.D.F. en 1969; II - Mesures par Appareils, S.F.). Text in French. Electricite de France, St. Denis, Lab. de Prevention des Pollutions, 103p., 1970.

The average daily acidity (sulfur dioxide concentration) and the dust count were measured during 1969 at Dunkirk and in 21 other French communities, including 8 locations in the Paris complex. The results are tabulated by months for each locale, both the acid and suspended dust readings being in mg per cubic meter. No interpretation is given of the data.

10130

APTIC NO. 27830

Mamuro, Tetsuo, Akira Fujita, and Yatsuka Matsuda

ACTIVATION ANALYSIS OF AIRBORNE DUST.

Annu. Rep. Radiat. Cent. Osaka Prefect., vol. 10:9-20, 1969. 6 refs.

A preliminary experiment is reported in which samples of airborne dust in Sakai were collected on membrane filters and irradiated for one hr at a neutron flux of 9.4×10^{12} times the 12th power n/sq cm/sec. Gamma-ray spectra of the samples were measured at various intervals after irradiation with a Ge(Li) detector and compared with the spectra of irradiated reference samples to determine atmospheric concentrations of metallic elements. In this way concentrations of cobalt, iron, chromium, scandium, rubidium, zinc, and cadmium were determined without chemical separation. Besides these elements, exact determination for many others is considered possible if proper references are used. Based on these results, plans are being made to measure monthly concentrations of metallic elements for at least a year in Osaka and Sakai.

10131

APTIC NO. 27831

Noushi, Hiroshi, Takahiro Seto, Kyoji Yamazaki, and S. Izumigawa

ANALYSIS OF METALLIC COMPONENTS OF SUSPENDED DUSTS BY ATOMIC ABSORPTION SPECTROSCOPY AND THE RESULTS OF MEASUREMENTS CONDUCTED IN TOKYO.

(Genshi kyukobunsekiho ni yoru fuyu jinaichu no kin-zokuseibunbunseki ni taisuru jakkan no kento to tonai ni okeru sokuteikekka ni tsuite). Text in Japanese. Tokyo-toritsu Eisei Kenkyusho Kenkyu Hokoku (Rept. Tokyo-to Lab. Med. Sci.), no. 20: 115-118, 1968. 3 refs.

The concentrations of elements such as iron, manganese, nickel, lead, zinc, copper, chromium, and cadmium were measured in Tokyo. The apparatus used included a Perkin Elmer atomic absorption spectroscope and a Staplex hi-volume sampler. The data obtained from the measurements are tabulated and compared to the values obtained by the Ministry of Health and Welfare at Japan Environmental Sanitation Center using photo-emission spectroscopy. Considering the maximum allowable concentration of heavy metal elements in the environment as one-hundredth that of the working environment, calculations showed that lead was closest to the maximum allowable concentration. This is probably due to automobile exhaust emissions.

10132

APTIC NO. 27832

Hirafune, Kiyohiko and Masanao Takahashi

AIR POLLUTION INVESTIGATION IN MATSUO VILLAGE: SULFUR DIOXIDE GAS AND SUSPENDED DUST PARTICLE COMPONENTS.

(Matsuo-mura no taiki osen chosa. Arysuan gasu to fuyubaijinseibun ni tsuite). Text in Japanese. Iwate-Ken Eisei Kenkyusho Nenpo (Ann. Rept. Iwate Inst. Public Health), no. 12:116-124, 1968. 6 refs.

Matsuo Village in Iwate Prefecture is the site of a hydrochloric acid manufacturing plant. Air pollution in Matsuo was measured by the PbO₂ rosanilin, and formalin methods for sulfur dioxide and by a hi-volume air sampler for suspended dusts. The highest value obtained for measurements at six locations by PbO₂ method was at Hayashi, 1.96 SO₃ mg/day/100 sq cm, the lowest value was at Fujine, 0.30 SO₃ mg/day/100 sq cm. The level of SO₂ pollution increased from autumn to winter, and tended to spread over a larger area. The 24-hour measurement of SO₂ by rosanilin and formalin methods showed the average concentration of 0.038 ppm at Hata. Measurements at Hata and Kashiwadai yielded less than 100 mg/cu m for suspended dusts and the air was considered to be clean. As for chemical components, pH was weakly acidic, and SO₄ (-2) was relatively large, apparently due to sulfur dioxide.

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APTIC NO. 27837

Mie Prefectural Univ. School of Medicine, Tsu (Japan), Dept. of Public Health

ON THE RESULTS OF AIR POLLUTION INVESTIGATION IN YOKKAICHI. NO. 7.

(Yokkaichi-shi ni okeru taikiosen chosakekka ni tsuite. Dai-7-ho). Text in Japanese. 35p., May 1968. 1 ref.

Air pollution investigations in Yokkaichi conducted between November 1966 and October 1967 are presented. The measurement of sulfur dioxide was changed from alkali filter method to lead peroxide method starting April 1967. Settling dusts decreased about 12% compared to the previous year, especially significantly in Isozu Area. The soluble components of

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the dust are increasingly occupied by Cl^- and SO_4^{2-} . The pH that has been on the decrease showed no change, as was the case the previous year. Sulfur dioxide increased about 6% over the previous year. The increase was large in winter and in commercial and residential areas. Amagase Area in the north also showed an increase as one of the pollution source areas. In the industrial areas, sulfur dioxide decreased. Nitrogen dioxide increased, especially in winter, and the pollution in the center city showed an increasing trend. Hydrogen sulfide generally decreased. Extensive data on the pollutants are also presented.

10134

APTIC NO. 27839

Sato, Akira, Masanao Takahashi, and Tetsuo Kudo

STUDIES ON ATMOSPHERIC POLLUTION IN IWATE PREFECTURE. NO. 9. HEAVY METAL CONTENT IN SETTLING DUSTS. PART II.

(Iwate-ken no kogai ni kansuru kenkyu. Dai-9-ho. Kokabaijincho no jukinzokuganryo. 2). Text in Japanese. Iwate-Ken Eisei Kenkyusho Nenpo (Ann. Rept. Iwate Inst. Public Health), no. 12:71-99, 1968. 4 refs. PART I. Ibid., no. 12:44-70, 1968.

Results concerning the heavy metal components of settling dusts in the industrial districts of Iwate Prefecture are described (Kamaishi, Kuni, and Higashiyama), especially taking into account Ofunato, cement-producing town. The results obtained from the earlier investigations were re-examined, and toxic heavy metals in settling dusts were determined more expediently by means of the recently acquired atomic absorption spectroscopy. Metallic components characterized the various areas (industries); of all toxic metals under scrutiny, copper and zinc were found in all areas. In Higashiyama, the amount of calcium contained in the urine of the residents (average of 660 mg/l) was much larger than that of the factory workers (530 mg/l). Further investigation of the toxic metals in settling dust is considered to be necessary in order to reveal their relationship with the biochemical effects on human health.

10135

APTIC NO. 27841

Ministry of Health and Welfare, Tokyo (Japan), Bureau of Public Nuisance

AIR POLLUTION IN 1970.

(Taiki osen no genkyo ni suite, showa 45 nen). Text in Japanese. Sangyo Kogai (Ind. Public Nuisance), 7(2):100-101, Feb. 1971.

Sulfur dioxide levels were measured at 211 sites in Japan between April 1969 and March 1970, (fiscal year 1969). Thirty nine % of the measuring stations reported SO_2 concentrations above the environmental standard for SO_2 in contrast to 41% in 1968 and 50% in 1967. Cities where excessive SO_2 levels were recorded numbered 34 in 1969, 26 in 1968, and 29 in 1967. The current measurements marked the third consecutive year that 17 cities, including Tokyo, Yokohama, Sapporo, and Kyoto exceeded the SO_2 standard. Nine cities that failed to meet the standard in 1968 and 1967 qualified in 1969. Based on yearly averages, SO_2 levels have decreased in downtown Tokyo but increased in industrial areas of the city.

10136

APTIC NO. 27846

Judd, H. J.

LEVELS OF CARBON MONOXIDE RECORDED ON AIRCRAFT FLIGHT DECKS.

Aerospace Med., 42(3):344-348, March 1971. 4 refs.

A National Coal Board T.C.O. carbon monoxide detector and recorder was used to measure CO levels on aircraft flight decks at the John F. Kennedy and London Heathrow Airports. In spite of some quite moderate wind speeds during the measurement period (October 17, 1969-December 15, 1969), appreciable CO levels were recorded. At no time, however, did the levels reach 50 ppm, which is the accepted maximum for an eight-hr exposure. Nevertheless, the possibility exists that an aircrew on arrival at an airport may have been exposed to exhaust fumes and industrial atmospheric pollution and include heavy smokers who are more susceptible to CO through prior exposure. This fact together with effect of cabin pressurization on carboxyhemoglobin would indicate that CO levels on aircraft flight decks should be kept below 30 ppm.

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APTIC NO. 27869

Okita, Toshiichi

MEASUREMENTS OF THE CONCENTRATION OF SULPHUR COMPOUNDS IN THE ATMOSPHERE AND LABORATORY EXPERIMENTS ON THE OXIDATION OF SULPHUR DIOXIDE AT THE SURFACE OF PARTICLES.

Organization for Economic Cooperation and Development, Paris (France) and Bundesministerium fuer Gesundheitswesen (West Germany), Proc. Symp. Physico-Chemical Transformation Sulphur Compds. Atmosphere, Formation Acid Smogs, Mainz (West Germany), 1967, p. 75-86. (June 8-9, Paper 9.)

Based on colorimetric analysis of samples collected between 1962 and 1964, sulfate in cloud and fog at a rural site in Japan is present mainly as calcium sulfate. In contrast, ammonium sulfate and sulfuric acid predominate a mountain site (3206 m). The sulfur dioxide concentrations in the country and mountain air ranged from 1.4-6.0 micrograms/cu m. In related experiments, atmospheric particulates collected in Tokyo between 1962 and 1966 were analyzed for weight ratios of sulfate to ammonium. These were 1.1 for giant particles and 2.3 for large particles. The ratio of the sulfate to SO_2 concentration was 1.9-69, and the maximum sulfate concentration was 63 micrograms/cu m. Laboratory experiments indicated that manganese compounds, active carbon, and some components in coal soot are effective in producing sulfuric acid mist and that iron and calcium carbonate reacted with SO_2 to form sulfate in unsaturated air.

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APTIC NO. 27873

Ohira, Toshio

AIR POLLUTION IN TOKYO AND ITS CONTROL.

(Tokyo no taiki osen to sono seigyō). Text in Japanese. Tokyo Metropolitan Public Nuisance Research Inst. (Japan) and Tokyo Metropolitan Government (Japan), Conserv. Environ. Tokyo Symp. Proc., New York, 1970, p. 93-124. (April 13-15.)

Tokyo Metropolitan Government administration of matters concerning public nuisance includes air and water pollution control, noise pollution control, and ground settling, in addition to such general measures as site purchases in connection with factory relocation, and small business modernization program loans. There were 273 members of the municipal government staff assigned to public nuisance in 1969 under the jurisdiction of the Capital City Planning Bureau, distributed among the Public Nuisance Prevention and Planning and Public Nuisance Control divisions, and the Public Nuisance Research Institute. Public nuisance related to solid waste is handled by the Sanitation Bureau. The air pollution section of

the present paper deals with the general description of air pollution in Tokyo and gives some basic statistics: the annual variation in the sales of fuels in Tokyo, the annual variation in the number of cars, yearly changes in which carbon monoxide concentration exceeding 10 ppm. Also monthly 24-hour variations in the sulfur dioxide concentration measured in Tokyo Tower are graphically represented. Also of interest is the concentration distribution of carbon monoxide along the major traffic intersections of main highways in Tokyo. The flow-chart of the Tokyo Air Pollution Control Center is shown.

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APTIC NO. 27960

Ministry of Health and Welfare, Tokyo (Japan), Bureau of Environmental Sanitation

FISCAL YEAR DATA ON SO₂ AIR POLLUTION OF DESIGNATED AREAS THROUGHOUT JAPAN.

(Shows 44-nendo zenkoku shiteichilki SO₂ ni yoru taikiosen deta). Text in Japanese. Kogai to Taisaku (J. Pollution Control), 7(2):117-122, Feb. 1971.

Data are compiled for sulfur dioxide measurements carried out by the Japanese government at 211 nationwide sites in 1969. For each station, the data include total hours of measurement, the yearly average, the 99% value, the probability of a one-hr value not exceeding 0.1 or 0.2 ppm, the probability of a daily average not exceeding 0.05 ppm, the frequency of occurrence of emergency levels, the number of emergency periods lasting for three or more consecutive days, the highest value, and the number of hours when concentrations were 0.2 ppm or higher. According to the data, 83 of the 211 stations have an air quality below the established minimum criteria. The number represents 39% of the stations, a decrease from 41% in 1968 and 50% in 1967. However, cities with one or more stations indicating excessive air pollution numbered 34 in 1969 against 23 in 1968 and 29 in 1967. Seventeen cities, including Tokyo and Sapporo, failed to meet the air quality criteria for the third consecutive year. Currently, Japan is classified into eight regions with respect to sulfur dioxide emission standards, which are more stringent for such densely populated areas as Tokyo and Osaka.

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APTIC NO. 20975

Briggs, G. A.

PLUME RISE.

Oak Ridge, Tennessee, Atomic Energy Commission, Div. of Technical Information, Nov. 1969, 81p. 150 refs.

CFSTI: TID-25075

Plume diffusion is discussed with respect to aerodynamic effects due to the presence of the stack, buildings, and topographical features; plume rise, relative to the mean motion of the air, due to buoyancy and initial vertical momentum of the plume; and diffusion, due to turbulence in the air. Plume rise observations made in the atmosphere, in wind tunnels, in towing channels, and in trucks are reviewed, and an attempt is made to fit previously derived empirical formulas to data obtained in the observations. Each existing formula is shown to be unapplicable to all plume rise conditions, and a simple theoretical model is derived that fits most of the data. The model makes use of the simplest workable entrainment and drag-force assumptions, simple approximations for the atmosphere treats the plume as being either nearly vertical or nearly horizontal. The inverse wind speed relation generally

valid for the rise of a hot plume at a fixed distance downwind in near-neutral conditions. Nine formulas of this type are compared with data from 16 different sources. The best agreement is obtained from the 'two-third law' according to which plume rise above the top of the stack equals $1.6 F^{1/2} U^{-1/3}$, where F is buoyancy flux parameters; U the average wind speed at stack level; and X , the horizontal distance downwind of the stack. The formula is modified by an assumption that a ceiling height is reached at a distance of ten stack heights downwind. Formulas are also presented for predicting the rise of buoyant plumes in neutral stratification and under calm conditions. Formulas of a similar type are recommended for nonbuoyant plumes on the basis of much more limited data. (Author abstract modified)

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APTIC NO. 21277

Crutzen, P. J.

THE INFLUENCE OF NITROGEN OXIDES ON THE ATMOSPHERIC OZONE CONTENT.

Quart. J. Roy. Meteorol. Soc. (London), vol. 96:320-325, 1970. 20 refs.

Recently measured nitric acid concentrations in the stratosphere tend to support the hypothesis that nitrous oxide, produced possibly by microbiological action in the soil and diffusing upward through the troposphere, may be partly converted to 'odd nitrogen' (NO and NO₂) by a photodissociation process in the stratosphere. This paper considers the direct controlling effect of NO and NO₂ concentrations on ozone distribution in the stratosphere and their subsequent effect on atmospheric ozone production rates. A reaction scheme for the photolysis of ozone is proposed. Special attention is given to the reduction of odd oxygen by odd nitrogen. As indicated by estimates of the daily production and destruction of odd oxygen below 50 km at the equator, reduction of odd oxygen by odd nitrogen is dominant between 25 and 40 km. In the stratosphere, reduction of odd oxygen by OH and HO₂ may be of greater importance.

10142

APTIC NO. 22335

Hales, Jeremy M., James O. Wilkes, and J. Louis York

THE RATE OF REACTION BETWEEN DILUTE HYDROGEN SULFIDE AND OZONE IN AIR.

Atmos. Environ. (London), 3(6):657-667, Nov. 1969. 6 refs.

Gas-phase oxidation by ozone is believed to be an important factor in the removal of atmospheric hydrogen sulfide. In addition, this reaction is thought to be significant in some odor control processes involving hydrogen sulfide and organic sulfur compounds. Since little is known about the mechanism of the reaction, experimental data on the rate of reaction between dilute hydrogen sulfide and ozone in air were obtained from two tubular, laminar-flow reactors. Internal diameters of the reactors were 3/8 in. and 1/4-in. Production of sulfur dioxide by the reaction between hydrogen sulfide and ozone was measured at 28.5 C and 48 C. Results from the reactors at 28 C, when computed as homogeneous reaction rates, fell on the same curve within the limits of experimental error. From this it is concluded that the observed data represented an almost totally homogeneous reaction. Linear regression performed on the results at 28 C showed the reaction orders to be 0.495 and 1.562 in hydrogen sulfide and ozone, respectively. On the basis of the total results, an expression was derived for the rate of generation of sulfur dioxide by the reaction of hydrogen with ozone in the absence of light, the expression also representing the rate of depletion of hydrogen sulfide and ozone. From the results of previous authors, the expression $H_2S + O_3$ to yield

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SO₂ + H₂O is thought to represent the true stoichiometry adequately under the experimental conditions of the study.

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APTIC NO. 22918

Leahy, Douglas M.

AN URBAN HEAT ISLAND MODEL.

In: *Mathematical Models of Urban Air Pollution Dynamics. (Final Report).* New York Univ., N. Y., Geophysical Sciences Lab., NAPCA Research Grant AP-00328-04, N. Y. U. TR-69-11, Vol. 111, 70p., Dec. 1969. 35 refs.

Artificial heat sources cause the base of stable air layers, which are at ground level in rural regions, to become elevated over urban areas. An intervening layer characterized by an adiabatic lapse rate is formed. Pollutants are trapped within this layer and mixed in the vertical. A model is presented for the urban heat island which is based on the above premises and the first law of thermodynamics. It is a modified version of the advective model advanced by Summers. The modification consists of the introduction of two heat sinks which permit an extension of the model downwind from the center of the city. Associated with the model is a method for predicting the variation of pollution within the urban heat island. The method relates the mixing ratio of a pollutant to the thickness of the adiabatic layer. Data collected from an instrumented helicopter allowed extensive testing of the model for New York City. The agreement between the observed and predicted values for the depths of the mixing layer and for sulfur dioxide mixing ratios is very encouraging. Linear correlation coefficients between the observed and predicted depths of the mixing layer and for SO₂ are .95 and .84, respectively. The model also permitted estimates to be made of heat release from the pavements, asphalt, and concrete of New York City. These estimates are the only quantitative values available for an urban complex. (Author abstract modified)

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APTIC NO. 24578

Eichmeier, A. H.

MORE ABOUT AIR POLLUTION PROBLEMS. METEOROLOGICAL CONDITIONS AFFECTING AIR POLLUTION.

Am. Foundryman, 19(3):51-53, March 1951. 8 refs. (Presented at the Michigan Regional Foundry Conference, East Lansing, Nov. 10-11, 1950.)

The two meteorological factors most directly involved with air pollution are wind and the vertical temperature lapse rate. Stable air, as in inversion situations, prevents diffusion of pollutants. Conditions favorable for extreme fog are associated with stagnant deep anticyclones. Seasonal influences and topographical interactions can have significant effects on pollutant concentration. Rain and snow are very effective cleansing agents. Tall stacks aid in the dispersion of pollutants, but they are ineffective under certain meteorological conditions. Atmospheric pollution can be minimized by proper control equipment, such as precipitators, scrubbers, or collectors. Industrial emissions can be varied according to weather conditions to lessen pollution. The proper choice of site for industrial operations can reduce pollution potential. Accepted Weather Bureau definitions for smog, lapse rate, stability, convection, anticyclone, turbulence, and insolation are given.

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APTIC NO. 25537

Gibbon, Bob

AIR QUALITY MODEL SIMULATES TORONTO SKIES.

Water Pollut. Contr., 108(12):48-49, Dec. 1970.

To effectively combat air pollution in Toronto, Ontario's Air Management Branch has developed a catalogue system that inventories virtually every source of emission. The system also takes into account such variables as weather conditions, topographical features, and seasonal changes. Since the wind field will have a direct bearing on pollution levels, it was defined in terms of a stream function. Factors that could alter the value of the stream function include hill and valley contours which deflect the wind stream, and thermal gradients which can cause distortions in the wind stream. An information system contains all pertinent air quality data including the actual types of pollutants as well as quantities emitted. This inventory includes sulfur dioxide, nitrogen oxide, carbon dioxide, hydrocarbons, and particulates. The mathematical model will relate the climatic and pollution factors to air quality using computer facilities to do the calculations. A brief discussion is included indicating the manner in which pollution source information was obtained.

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APTIC NO. 27711

Sklarew, Ralph C.

A NEW APPROACH: THE GRID MODEL OF URBAN AIR POLLUTION.

Preprint, Air Pollution Control Assoc., Pittsburgh, Pa., 42p., 1970. 19 refs. (Presented at the Air Pollution Control Association, Annual Meeting 63rd, St. Louis, Mo., June 14-18, 1970, Paper 70-79.)

In the grid model of urban air pollution, the region of interest is divided into a grid of cells in which the Fickian diffusion equation of K-theory is solved including advection. The time-dependent solution of the diffusion equation is obtained numerically from difference equations. A hybrid scheme is used in which calculational particles representing specific amounts of pollutants are advected in an Eulerian grid. Dispersion by eddy diffusion is included with a pseudo-velocity that is added to the advection velocity. For each cell photochemical reactions are described by the chemical kinetics rate equations using a lumped parameter approximation. The meteorological parameters, diffusivity tensor and wind velocity vector, are specified separately for each cell at each time step. Terrain and interactions with the boundary can easily be treated. An outline of the calculational steps in a sample model is presented and pollutant patterns for single and multiple sources in shear wind and inversion conditions as calculated by the model are illustrated. The present status of grid model development efforts, including current obstacles, are discussed. As needs for greater air quality control increase, the grid model will receive wider application since it is the only model capable of simulating non-linear photochemical smog evolution, with temporal- and spatial varying meteorology and emissions in a topographically complex region. (Author abstract modified)

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APTIC NO. 27720

Day, Walter C. and Robert F. Rohrer

PROJECT PRE-CONDOLA I: CLOUD DEVELOPMENT STUDIES (FINAL REPORT). Army Engineer Nuclear Cratering Group, Livermore, Calif. and California Univ., Livermore, Lawrence Radiation Lab., 78p., Sept. 1967. 14 refs.

CFSTI: PNE 1108

Clouds resulting from four 20-ton nitromethane cratering explosions in a wet clay shale medium were studied by photographic analysis and lidar (laser-radar) tracking. A technique for detecting tracers in future events in the same medium was

investigated. It was found that the clouds were unique in that (1) they were very diffuse (low particle density) and ceased to be visible within several min, (2) there were no clouds resulting from dynamic venting during mound rise, and (3) steam was visible in the base surge clouds. Base surge radius dimensions observed were larger than those observed in basalt and smaller than those observed in alluvium. Base surge height dimensions were much larger than those previously observed in any medium due to the steam present in the cloud. Lidar tracking was successful and indicated its capability to provide information as a function of time on the position, motion, growth, and internal structure of cratering explosion clouds. Cloud sampling indicated that the several elements including palladium, cadmium, indium, and europium are suitable for use as tracers in future chemical exploding cratering events. (Author abstract)

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APTIC NO. 27730

Sidebottom, Howard W., Charles C. Badcock, Jack G.

Calvert, Blaine R. Rabe, and Edward K. Damon

THE MECHANISM OF THE PHOTOLYSIS OF MIXTURES OF SULFUR DIOXIDE WITH OLEFIN AND AROMATIC HYDROCARBONS.

Preprint, Ohio State Univ., Columbus, Dept. of Chemistry and Ohio State Univ., Columbus, ElectroScience Lab., 33p., 1970. 27 refs.

The practical concern over the nature and mechanism of the sulfur dioxide-removal paths in urban atmospheres has been increasing. The possible role of SO₂ in aerosol formation in olefin-containing auto-exhaust polluted environments has been suggested. Triplet sulfur dioxide molecules were excited directly by absorption of a laser pulse of 3828.8 Å light within the 'forbidden' band. From the measured phosphorescence intensities as a function of time, the triplet SO₂ lifetimes were determined in experiments at 25 deg and at varied pressure of added olefinic or aromatic hydrocarbon or ketone. The slopes of the plots of 1/tau versus added reactant pressure yielded triplet SO₂-quenching rate constant estimates for ethylene, trichloroethylene, trifluoroethylene, propylene, cis-2-butene, cyclopentene, benzene, hexafluorobenzene, acetone, and biacetyl. These rate constant data and a triplet SO₂-reaction mechanism are consistent with previously published product rate studies of SO₂-olefin systems photolyzed previously published product rate studies of SO₂-olefin system photolyzed within the first allowed SO₂ absorption band (2400-3200 Å). The photochemical changes in all of these systems result from the reactions of the triplet SO₂ molecules alone. The singlet excited state of SO₂ seems important only as a source of triplet SO₂ molecules through intersystem crossing. Speculation is given concerning the detailed mechanism for triplet SO₂ quenching reactions in the SO₂-olefin mixtures. All of the published data fit well the hypothesis that the quenching reactions involve a strong interaction between the pi-electron system of the olefin and the electrophilic reagent triplet SO₂. This interaction is presumed to lead ultimately to the addition of triplet SO₂ to the double bond. The several overall photochemical processes which have been observed in these systems can be rationalized well in terms of four alternative reaction paths of the intermediate diradical product formed in the addition reaction. (Author abstract modified)

10149

APTIC NO. 27740

Munn, Robert Edward and Henning Rodhe

ON THE METEOROLOGICAL INTERPRETATION OF THE CHEMICAL COMPOSITION OF MONTHLY PRECIPITATION SAMPLES.

Stockholm Univ., Sweden, Inst. of Meteorology and International Meteorological Inst., Stockholm, Sweden, Rept. AC-10, 41p., Sept. 1970. 10 refs.

A methodology is presented for studying the influence of synoptic weather patterns on the chemical composition of monthly precipitation samples. The data selected for illustration are the sulfur and chloride monthly depositions at two stations in southern Sweden, Plönninge (coastal) and Flahult (inland), the observations extending from 1951 to 1969. The monthly values have been grouped in various ways into subsets of about 24 members. An initial grouping according to monthly precipitation amounts yielded curvilinear relations between deposition and precipitation. Another grouping by 2-year time periods revealed a marked increase in sulfur deposition at both stations in the early 1960's: chlorides, on the other hand, were highest in the middle 1950's, and the secular variations at Plönninge were not in phase with those at Flahult. A weather classification was developed based on the direction of the surface geostrophic wind over southern Sweden during periods of precipitation. For sufficiently wide sectors and for medians of large samples of data, this proved to be a useful predictor of deposition. All precipitation events during the 18 years of record were thus classified, and linear relations were established between median depositions and median monthly frequencies of precipitation-bearing SE-SW-NW flows (sulfur) and SSW-NW flows (chloride). For chloride, most of the secular variations at Plönninge could be explained with this index. The method was not so successful at Flahult, probably because the upwind arc was too wide at that station: the principal source for chlorides is the sea, and SSW winds have not generally had a recent over-water trajectory before reaching Flahult. For sulfur, the secular variations in the frequencies of precipitation-bearing SSW-NW flows were very closely in phase with median sulfur depositions 1951-1969. There was evidence, however, for a residual upward trend in sulfur depositions. A linear regression analysis that included both weather frequencies and time as dependent variables yielded a best estimate for this trend of 2 to 3% per year, a figure not in disagreement with estimates of the rise in emissions of anthropogenic sulfur. (Author abstract)

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APTIC NO. 27743

Timmons, Richard B.

THE PHOTOCHEMICALLY INDUCED REACTIONS OF SULFUR DIOXIDE WITH ALKANES AND CARBON MONOXIDE.

Photochem. Photobiol., vol. 12:219-230, 1970. 24 refs.

Under atmospheric conditions, the high sulfur-oxygen bond dissociation energy of sulfur dioxide precludes its direct photochemical decomposition. Hence, if SO₂ is to enter into reactions of atmospheric importance, it must do so through reaction of electronically excited SO₂ molecules or reactions of free radicals with SO₂. Thus, gas phase photochemical reactions of SO₂ induced by 3130 Å radiation were studied in the presence of added alkanes or added carbon monoxide. In the reactions with the low molecular weight alkanes, lower quantum yields were obtained than those found by previous workers. The quantum yields were pressure dependent, increasing slowly with increasing pressure. A stoichiometric

ratio of one SO₂ removed per molecule of hydrocarbon consumed was observed only under experimental conditions with SO₂ less than the alkyl group. For reaction mixtures where SO₂ was greater than or equal to the alkyl group, the ratio of SO₂/RH reacted always exceeded unity. Quantum yields decreased slightly with increasing temperature. In all the alkane reaction systems studied, the deposition of viscous, non-volatile reaction products was observed. In the experiments with added CO, the quantum yields were computed with respect to the rate of carbon dioxide formation. At 25 C and equal pressures of SO₂ and CO, the quantum yield of CO₂ was 0.005 and it decreased slightly with increasing temperature. The results obtained are interpreted in terms of the sulfoxidation of the alkanes and the oxidation of CO proceeding by way of a triplet SO₂ reaction intermediate. (Author abstract modified)

10151

APTIC NO. 27744

Warmbt, W.

RELATIONSHIP BETWEEN METEOROLOGICAL CONDITIONS, ABSOLUTE MONTHLY AVERAGES OF SURFACE-AIR OZONE AND ARTIFICIAL BETA-ACTIVITY OF AIR.

Academy of Sciences of the Lithuanian SSR, Inst. of Physics and Mathematics, Conf. Acad. Sci. Lithuanian SSR Atmos. Scavenging Radioisotopes Proc. Sess. Inst. Phys. Math., Palanga (USSR), 1966. (June 7-9.) 12 refs. Translated from Russian. Israel Program for Scientific Translations, Jerusalem, p. 135-142, 1970.

NTIS: TT 69-55099

Data on ozone and artificial beta-activity levels, collected at a low-level and a mountain station in East Germany from 1959 to 1964, are compared to study their temporal variations with each other and with meteorological conditions. Surface ozone was measured by Cowey's method, and radioactivity by air filtering. Almost simultaneous increases were observed between the variations of the two values, suggesting a common supply of both from the stratosphere. High ozone and radioactivity concentrations apparently prevail when downward air-mass transport predominates and the atmospheric and ground-level processes interfering with it are at a minimum. The correlation held true both during periods of nuclear testing and during the test moratorium. Dissociation of ozone, particularly at ground level and due to reducing gases such as sulfur dioxide originating primarily from human activities, occurs very actively in winter when the air is stably stratified and a vertical transfer is insignificant; thus no clearly defined changes in ozone and radioactivity concentrations were observed at the low-level station in Feb. A time gap was observed at the mountain station in the variations of the two values, possibly dependent on meteorological processes. A table of relationships observed between ozone and radioactivity concentrations and the main types of weather is given.

10152

APTIC NO. 27745

WASHOUT OF RADIOACTIVE ISOTOPES AND CHEMICAL COMPOUNDS FROM THE ATMOSPHERE.

Academy of Sciences of the Lithuanian SSR, Inst. of Physics and Mathematics, Conf. Acad. Sci. Lithuanian SSR, Atmos. Scavenging Radioisotopes Proc. Sess. Inst. Phys. Math., Palanga (USSR), 1966. (June 7-9.) 28 refs. Translated from Russian. Israel Program for Scientific Translations, Jerusalem, p. 174-184, 1970.

NTIS: TT 69-55099

An analysis is presented of published data collected in England from 1957-1964 at relatively clean air sites on the concentration of nine individual radioactive isotopes of global origin and chemical compounds in precipitation water and in the air. Isotope washout is characterized by the ratio of their concentrations in precipitation and in air at the cloud-layer altitude. Relationships are found between the concentration of global-origin isotopes and chemical compounds in precipitation on the one hand and the precipitation total on the other. The slope of these curves yields the washout rate of the corresponding substances. Differences are noted in the washout rates of individual isotopes: zirconium (95) is the most rapidly scavenged from the atmosphere, strontium (90) is washed out better than cesium (137) and strontium (89), while the washout rate of antimony (125) and other isotopes is much less. Sulfates are washed out from the atmosphere somewhat less than chlorides and carbonates. The washout times of isotopes and sulfates from the atmosphere are approximately 24 hrs. Washout of industrial pollutants is better at their origin than far from it. An attempt is made to ascribe these relationships to features of aerosol particle transport and their future aging in the atmosphere. These factors affect the particle sizes, which determine their rate of removal by precipitation. (Author abstract modified)

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APTIC NO. 27750

METEOROLOGICAL FUNDAMENTALS FOR ATMOSPHERIC TRANSPORT AND DIFFUSION STUDIES.

In: *Meteorology and Atomic Energy 1968*. David H. Slade (ed.), Washington, D. C., AEC Div. of Technical Information, 1968, Chapt. 2, p. 13-63. 32 refs.

The physical basis of local climate includes a discussion of solar radiation and the earth's energy balance as well as the local energy balance. Such characteristics as latitude, location within the landmass, altitude, slope of the ground, type of soil, nature of the ground cover, and proximity to areas of different geographical properties determine the evolution of meteorological conditions at a given location in response to the large scale meteorological conditions to which that location is exposed. It is this local response that results in the turbulent fluctuations of the air motions, which are, in turn, the determining factors in the diffusion of atmospheric properties and pollutants. The general circulation, air-mass weather, isolated disturbances within an air mass, air mass boundary systems, weather systems associated with fixed geographic features, and chaotic systems are discussed. Climatology and the use and collection of available weather data are also described. Some sources of summarized meteorological data are indicated, as well as operation of the National Weather Records Center. The vertical temperature structure of the lower atmosphere is discussed, including its diurnal and seasonal cycles. Atmospheric stability and pollution is discussed. Local wind structure includes a consideration of the mean vertical structure of the horizontal wind, atmospheric turbulence, and fluctuations of the wind. Diffusion is discussed from an instantaneous point source and the continuous point source. Other source configuration and nonideal plume characteristics are also described.

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APTIC NO. 27792

Suzuki, Shin

GENERATION MECHANISM OF PHOTOCHEMICAL SMOG.

(Hikarikogaku sumoggu no hasseikiko). Text in Japanese. Preprint, Electro-Chemical Soc. of Japan, Tokyo, Kanto

Div., 17p., 1971. (Presented at Electro-Chemical Society of Japan Air Pollution Seminar, Feb. 3-4, 1971, Paper 8.)

Photochemical smog is discussed in terms of data quoted mostly from the Los Angeles smog study made by the U.S.A. researchers. Various substances expected to produce photochemically oxygen, nitric oxide, nitrogen dioxide (with the radicals R, RO, HCO, and OH), hydrogen, aldehydes, hydrocyanic acid and sulfur tetroxide were shown with their respective speeds of formation (pphm/hr). They included nitrogen dioxide, ozone, alkyl nitrite, nitric acid, alkyl nitrate, aldehyde, ketone, formaldehyde, aromatic aldehyde, organic peroxide, and sulfur dioxide. Three types of photochemical smog, London, Los Angeles and Tokyo, were compared with each other as to conditions in which each was most likely to occur. Whereas the London smog was most likely to occur in the early morning, when the temperature is low, the humidity high, and a light rain is falling, the Los Angeles smog was at midday, with a high temperature and low humidity on a fine day. The Tokyo smog occurs usually at midday, with a high temperature and high humidity, also on a fine day. The London smog adversely affects the respiratory organs; the Los Angeles smog irritates eyes; while the Tokyo smog adversely affects both respiratory organs and eyes. Several data indicating that ozone has much to do with smog occurrence were also quoted. With regard to the generation mechanism of photochemical smog, the reaction formulae established in the analysis of the Los Angeles smog, including the Stephens reaction formula, were presented. This analysis reported that nitrogen dioxide and hydrogen carbide had been primarily responsible for formation of the Los Angeles smog. As to the conditions under which a photochemical smog is most likely to occur, a recent report by Pitts and others is quoted which reported that there should be a proper mixing ratio between nitrogen dioxide and hydrogen carbide to induce the photochemical reaction, provided that the density of both substances had reached a certain level. Such factors as the intensity of sun rays, the wind speed, the height of inversion layer and other weather conditions had, in addition, much to do with the smog occurrence.

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APTIC NO. 27820

Turner, W. C.

ATMOSPHERIC POLLUTION.

Weather (London), 10(4):110-119, April 1955.

The history of atmospheric pollution subsequent to the Industrial Revolution is traced with special reference to the advent of chemical pollution and smoke pollution caused by the combustion of solid or liquid fuels in furnaces and heat engines. Many sources of chemical pollutants are controlled by the Alkali etc., Works Regulation Acts of 1906, but a number are still unregistered. Among these are power stations, coke ovens, metallurgical processes lime burning, and stone crushing. In a few instances, workers are protected by the Factory Acts against such harmful compounds as hydrogen sulfide, beryllium, and arsenic. Under normal conditions, there can be no excuse for gross emissions of smoke from industrial appliances; the causes are known and the remedies are at hand. In spite of industrial pollution, the most serious nuisance arises from domestic chimneys, the low-temperature combustion of the bituminous fuel used for domestic heating giving rise to many noxious and tarry distillation products present in industrial effluents. Moreover, these products are discharged at a low level, lessening the opportunity for adequate dilution and dispersal. The meteorological aspects of air pollution are noted together with physiological aspects.

10156

APTIC NO. 27823

Rastorguyeva, G. P.

CHARACTERISTICS OF THE THERMAL REGIME OF CITIES.

In: *American Institute of Crop Ecology Survey of USSR Air Pollution Literature Effects of Meteorological Conditions and Relief on Air Pollution; Air Contaminants - Their Concentration, Transport, and Dispersal*. M. Y. Nuttonson (ed.), Vol. 5, Silver Spring, Md., American Institute of Crop Ecology, 1970, p. 10-17. 17 refs. (Also: *Tr. Gl. Geofiz. Observ. (Leningrad)*, no. 238:145-152, 1969.)

To study the combined influence of natural and urban landscape on the meteorological regime of the industrial city of Donetsk, USSR, surface humidity and air temperature measurements were taken at points representative of asphalt in the city proper and bare soil and grass in suburban areas. The peculiarity of this city is the fact that it is located on a dissected terrain where the heights are exceeded to a maximum of 100 m. The investigation showed that a heat island is formed in the afternoon hours and, as in other cities, manifests itself best during night hours in summer months. The increased influence of the city on the thermal region is the result of two factors promoting an increase in the air temperature of the city at night: an enhanced heat transfer in the central part of the city and a relative increase in the air temperature in this most elevated part of the city.

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APTIC NO. 27863

Westberg, Karl, Norman Cohen, and K. W. Wilson

CARBON MONOXIDE: ITS ROLE IN PHOTOCHEMICAL SMOG FORMATION.

Science, 171(3975):1013-1015, March 12, 1971. 10 refs.

The photochemistry of trace amounts of isobutene and oxides of nitrogen in an atmosphere of air was studied both in the presence and in the absence of small amounts of carbon monoxide. Experiments were performed in a 7.68 cu m, Teflon-lined, constant temperature, stirred smog chamber. Approximately 3 ppm of isobutene, 1.5 ppm of nitric oxide or nitrogen dioxide, and varying amounts of CO were mixed with an atmosphere of pure air and irradiated with light approximating the intensity and spectral characteristics of sunlight. CO markedly accelerates the disappearance of olefin, the conversion of NO to NO₂, and the appearance of ozone. A significant observation is that, contrary to previous opinion, CO is not inert in the production of photochemical smog and smog chamber measurements made in the past in which CO was used as a tracer must be reevaluated. The presence of iron carbonyl as an impurity in the CO on the order of 0.15% accelerated the rate of oxidation of NO to NO₂ even more than the CO alone. Reaction kinetics and possible mechanisms of reaction are discussed.

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APTIC NO. 27864

Ministry of International Trade and Industry, Tokyo (Japan), Chiba Prefecture (Japan), and Industrial Public Nuisance Control Association (Japan)

REPORT ON SUPPLEMENTARY SURVEY OF GOI AND ANEGASAKI AREA, CHIBA PREFECTURE.

(Goi, Anegasaki chiku hokan chosa hokokusho). Text in Japanese. *Sangyo Kogai (Ind. Public Nuisance)*, 7(2):58-70, Feb. 1971.

A 1969 study of the relationship between wind direction and velocity and high sulfur dioxide concentrations (over 0.2 ppm) indicated that SO₂ levels in Chiba and Ichihara reach a high in the summer months when the prevailing winds are SSW-W

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and SSW-NE, respectively, and wind velocity is less than 3 m/sec. In 1969, SO₂ exceeded 0.2 ppm for 55 hrs vs. 194 hrs for 1966. Moreover, there was hardly any pollution in 1969 when wind velocities were above 3 m/sec but considerable pollution in 1966 under the same conditions. Based on a projection of industrial fuel requirements for 1973, SO₂ emissions from the industrial belt in Chiba Prefecture will be 26,600 cu nm/hr during that year. This means that even with increasing numbers of tall stacks, atmospheric SO₂ could reach 0.79 ppm and that concentrations higher than 0.2 ppm could extend over wide areas. If plant emissions are restricted to 0.25 ppm, the sulfur content of fuel to 17%, and 30 m adopted as the minimum stack height, emissions in the industrial area would then be 19,800 cu nm/hr in 1973. However, further measures will be required to cope with the increasing number of factories projected to be in existence after 1974. With this in mind, meteorological conditions influencing pollutant diffusion must be studied and the air monitoring network expanded.

BASIC SCIENCE AND TECHNOLOGY

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APTIC NO. 20904

Kotin, Paul

MEDICAL INVESTIGATION OF AIR POLLUTION, LABORATORY METHODS.

A.M.A. Arch. Ind. Hyg. Occupat. Med., 10(4):286-294, Oct. 1954. 9 refs. (Presented at the section on Preventive and Industrial Medicine and Public Health, 103rd Annual Meeting of the American Medical Association, San Francisco, Calif., June 23, 1954.)

Laboratory methods used in Los Angeles county, California, for investigating the medical effects of air pollution are summarized under 3 categories: chemical (ascertaining the chemical composition of air to which human life is subjected); biological (in vitro and in vivo studies of animal behavior under simulated atmospheric conditions); and epidemiological. Special attention is given to the composition of Los Angeles smog, the design of inhalation chambers for the animal experiments, and the pathological conditions studied. In vitro studies, usually as orientation for in vivo studies, are conducted on amino acids, vitamins, non-protein hormones, purines, pyrimidine compounds, porphyrin group compounds, blood and blood pigment substances, serum proteins, and enzyme systems. In vivo studies (on mice, rabbits, and dogs) include such subjects as the effects on plasma proteins and enzyme systems in intact animals; respiratory studies; amino acid studies as a clue to changed protein structure; hemoglobin studies (oxyhemoglobin, nitric oxide hemoglobin, methemoglobin, and sulfhemoglobin); morphological changes in organ systems; and electrolyte studies (blood concentration and excretion).

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APTIC NO. 20954

Stedman, D. D., J. A. Meyer, and D. W. Setser

ENERGY-TRANSFER REACTIONS OF N₂ (A(3) Sigma U(+))I. QUENCHING AND EMISSION BY C₂N₂, SO₂, AND OTHER MOLECULES.

J. Am. Chem. Soc., 90(24):6856-6858, Nov. 20, 1968. 19 refs.

An argon-nitrogen flow system was used to study the reaction of N₂ (A(3)-Sigma u(+): v' equals 0(142 kcal), 1(146 kcal)) with oxygen, nitrous oxide, ethene, benzene, iodine, acetophenone, biacetyl, carbon disulfide, cyanogen, and sulfur dioxide. The reactions appeared to proceed by collisional

quenching with energy transfer from N₂(A). The molecules O₂, N₂O, C₂H₄, and C₆H₆ rapidly quenched the V-K emission without apparently giving rise to subsequent emission. The addition of iodine to N₂(A) showed a weak emission which consisted only of the 'continuum' between 2500 and 3450 Å. Acetophenone and biacetyl quenched the V-K bands and gave emission spectra similar to the known phosphorescence spectra of the lowest triplet states at 73.6 and 54.9 kcal. The addition of C₂N₂ quenched the V-K emission and gave a low-resolution spectrum. The intense bands of this system were clearly doubled with a splitting of 18 plus or minus 4 reciprocal cm. The addition of SO₂ gave a vibrationally relaxed triplet emission, although a singlet emission was also observed at 2500 Å. The emission spectrum of CS₂ was a continuum extending from 3500 to 6000 Å. It is concluded that the metastable studied is a good sensitizing agent for the study of high-energy triplet states.

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APTIC NO. 21159

Shearer, J. N., T. A. Wiggins, A. H. Guenther, and D. H.

Rank

L-TYPE DOUBLING IN N₂O.

J. Chem. Phys., 25(4):724-729, Oct. 1956. 32 refs.

Doublet separation in nine pi-pi bands of the linear nonsymmetrical molecule N₂O was measured in the region 1.5-2.4 microns. In addition to the doublet splitting caused by the up-silon 2 mode, it is shown that the parallel modes up-silon 1 and up-silon 3 contribute measurable amounts to this splitting in pi states. The doubling constant is thus a function of all three vibrational quantum numbers. The data satisfactorily fit an equation describing the Coriolis coupling of up-silon 2 with up-silon 1 and up-silon 3. The equation assumes that the effect of coupling is seen only by a change in the motion of the up-silon 2 mode, which has a degeneracy of 2, and that the oscillations caused by up-silon 1 and up-silon 3 are doubly degenerate. With one exception the observed doubling constants were consistent with calculated Coriolis constants.

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APTIC NO. 21685

Staley, D. O. and G. M. Jurica

FLUX EMISSIVITY TABLES FOR WATER VAPOR, CARBON DIOXIDE AND OZONE.

J. Appl. Meteorol., 9(3):365-372, June 1970. 9 refs.

Flux emissivities for the water bands and window, and for carbon dioxide and ozone, were evaluated from Elsasser's wavelength-dependent absorption coefficients and flux transmissivities. The flux emissivities for water vapor differ significantly from previously published emissivities based on Elsasser's incorrect flux densities. A flux emissivity correction for the overlap of H₂O and CO₂ is defined and evaluated for combinations of optical depths. The total H₂O flux emissivity is remarkably independent of temperature, especially in the range from minus 40 deg C to 20 deg C, as a result of near cancellation of the temperature dependences in three regions of the spectrum. The flux emissivity of CO₂ increases slightly with temperature at all but the very smallest optical depths. The flux emissivity of O₃ undergoes a large percentage decrease with temperature. (Author abstract modified)

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APTIC NO. 22456

Broadwell, Samuel J., Arthur E. Heath, and Lowell G. Wayne
**POSSIBLE KINETIC INTERACTION OF ETHYLENE
 AND OTHER OLEFINS IN PHOTOOXIDATION
 SYSTEMS.**

Preprint, California State Dept. of Public Health, Los Angeles, 7p., 1960. 6 refs. (Presented at the Conference on Methods in Air Pollution Studies, 4th, Los Angeles, Calif., Dec. 5-6, 1960.)

As part of an overall study of the hydrocarbon-nitrogen oxide relationships that produce eye irritation in smog, experiments are described to investigate whether the presence of the more active olefins in a photo-oxidation system would have an observable effect on the involvement of ethylene in the secondary reactions which follow the absorption of light. Using a White cell and infrared spectrophotometer system, mixtures of NO₂, ethylene, and 2-hexene were diluted with dry air in the 500-l volume of the optical cell, irradiated by a mercury arc lamp. Using a 120-m path, the infrared spectrum from 14.5 to 2.0 microns was scanned at intervals up to 20 hrs. Experimental results are given. The only probable type of kinetic interaction between reactions of ethylene and hexene in photo-oxidation with nitrogen dioxide is that of competition, and even that is of little importance quantitatively unless the hexene is present in considerable excess over the nitrogen dioxide. For practical purposes, in most studies on irradiation of automobile exhausts, this effect can be neglected

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APTIC NO. 22643

Bruns, Roy E. and Willis B. Person

**CALCULATED DIPOLE-MOMENT FUNCTIONS AND
 THE INFRARED INTENSITIES OF HCN AND N₂O.**

J. Chem. Phys., 53(4):1413-1417, Aug. 15, 1970. 17 refs.

The dipole moments of hydrogen cyanide and nitrous oxide are computed for different geometric configurations of these molecules, using the best available wave functions from the 'near-Hartree-Fock calculations. From these calculated dipole-moment functions the derivatives with respect to stretching coordinates of each molecule are computed and compared with the experimental values obtained from infrared intensity measurements. The absolute magnitudes of the calculated derivatives for both HCN and N₂O agree reasonably well with the experimental values. The relative signs of the calculated derivatives appear to be in agreement with the experiment for N₂O, but the signs are not consistent with experimental results for HCN. Possible reasons are suggested for this discrepancy, which appears to be more serious than the recent controversy regarding the sign of the carbon monoxide dipole moment. (Author abstract modified)

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APTIC NO. 23110

Shchekochikhan, Yu. M. and A. A. Davydov

**IR SPECTRA OF CARBON MONOXIDE ADSORBED ON
 GAMMA-AL₂O₃.**

Kinetics Catalysis (USSR) (English translation from Russian of: Kinetika i Kataliz), 10(5):914-918, Sept.-Oct. 1969. 13 refs.

Adsorption of carbon monoxide on gamma-aluminum oxide and alkali-treated Al₂O₃ was studied by infrared spectroscopy. When the aluminum oxide was heated to 400 C, three adsorption maxima with frequencies of 2360, 2720, and 2760 reciprocal cm were observed. Adsorption of CO at room temperature lead to the appearance of bands at 1343, 1355, 1372, 1544, 1562, and 1581 reciprocal cm. Simultaneously, the maxima at

2720 and 2760 reciprocal cm disappeared and the intensity of the 2630 reciprocal cm band decreased. Adsorption of CO at 20-400 C on aluminum oxide containing surface OH groups resulted in three maxima in the 1300-1400 reciprocal cm range and three in the 1500-1700 reciprocal cm range. These maxima (1355, 1361, 1380, 1590, 1627, and 1659 reciprocal cm) appear to be associated with the formation of surface formate ions having different degrees of ionization. Presumably, the difference in the degree of ionization of the surface ions is related to the nature of COO bonds as affected by octahedra, tetrahedra, and cationic defects in gamma-Al₂O₃.

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APTIC NO. 23339

Fehsenfeld, F. C. and E. E. Ferguson

**THERMAL ENERGY REACTIONS OF C(-) WITH O₂,
 N₂O, CO, AND CO₂.**

J. Chem. Phys., 53(7):2614-2615, Oct. 1970. 6 refs.

Thermal energy reactions of C(-) with oxygen, carbon dioxide, carbon monoxide, and nitrous oxide were measured by the flowing afterglow technique. The C(-) was produced by 100-eV electron impact on CH₄ and buffered in a large excess of He. The C(-) was largely in its ground state, since no charge transfer with O₂ was observed. The observed 300 K rate constants for the reactions studied are listed. They are believed to be reliable to plus or minus 30%.

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APTIC NO. 24147

Shaw, A. W. and A. J. Vosper

**DINITROGEN TRIOXIDE. PART VII. THE ABSORPTION
 OF NITRIC OXIDE BY DINITROGEN TETROXIDE
 AND THE PREPARATION OF PURE DINITROGEN
 TRIOXIDE.**

J. Chem. Soc., vol. 13:2193-2195, 1970. 25 refs.

Absorption of nitric oxide by liquid and solid dinitrogen tetroxide was studied. Dinitrogen tetroxide was distilled into a glass bulb of 15 ml capacity which could oscillate through an amplitude of 5 cm at a constant frequency which could be varied over a wide range. Nitric oxide was admitted to the absorption bulb from a gas-burette so that both the composition of the liquid and the absorption rate of NO could be measured as a function of time. Absorption rate increased with the degree of agitation of the liquid, probably as a result of the increasing interfacial area of the system. The maximum concentration of N₂O₃ which could be obtained by absorption was less than the equilibrium concentration at all temperatures and was almost independent of the degree of agitation of the liquid. Reactivity of solid N₂O₄ decreased with decreasing temperature, while it appears probable that NO reacts with N₂O₄ to form a thin impervious film consisting of N₂O₃ and N₂O₄. Above -60 C, this film can melt and fall away from the solid which can then be further attacked; but at the lower temperatures, this film does not melt completely and further reaction is not possible. Reactivity of the N₂O₄ depended only on the temperature and not on its thermal history. Various methods for the preparation of N₂O₃ are critically examined.

10168

APTIC NO. 27697

Johnson, G. L., L. S. Caretto, and E. S. Starkman

**THE KINETICS OF CO OXIDATION IN RECIPROCATING
 ENGINES.**

Preprint, Combustion Institute, Western States Sect., 28p., 1970. 14 refs. (Presented at the Combustion Institute, Western States Section, Spring Meeting, Berkeley, Calif., April 20-21, 1970, Paper WSCI-70-4.)

Carbon monoxide and carbon dioxide concentrations in a single cylinder reciprocating engine were measured as a function of time by a hydraulically actuated sampling valve and determined by nondispersive infrared analyzers. This was done for one engine operating condition at crank angles from 10 deg BTDC to 120 ATDC. The experimentally determined concentrations and the change in the mole number of CO and CO₂ in the cylinder are graphically represented. The figures show that hydrocarbon combustion is essentially complete at 27 ATDC and that at a point near 27 ATDC, the increase in CO₂ is the same as the decrease in CO. These results are in poor agreement with a kinetic analysis of CO oxidation, which indicated a rapid rise in CO concentration, approaching the equilibrium value. The kinetic calculations imply that the experimentally measured CO concentration, approaching the equilibrium value. The kinetic calculations imply that the experimentally measured CO concentrations are too far from equilibrium so that the system is driven in the direction of more CO. Possible reasons for these discrepancies are discussed.

10169

APTIC NO. 27699

Solly, Richard K., David M. Golden, and Sidney W. Benson
KINETICS AND THERMOCHEMISTRY OF THE GAS
PHASE REACTION OF METHYL ETHYL KETONE
WITH IODINE. I. THE RESONANCE ENERGY OF
METHYLACETONY RADICAL.

Intern. J. Chem. Kinet., vol. 2:381-391, Sept. 1970. 25 refs.

The gas-phase reaction of iodine (2.8-43.3 torr) with methyl ethyl ketone (MEK) (7.4-303.4 torr) was studied at 280-355 C in a static system. The initial rate of disappearance of I₂ is first order in MEK and half order in I₂. The rate-determining step is the abstraction of a secondary hydrogen atom by an iodine atom. The activation energy is equivalent to a secondary C-H bond strength of 92.3 ± 0.1 kcal/mole and the heat of formation of the methylacetony radical equals -16.8 plus or minus 1.7 kcal/mole. By comparison with 95 kcal/mole for the secondary C-H bond strength, when delocalization of the unpaired electron with a pi bond is not possible, the resonance stabilization of the methylacetony radical is calculated to be 2.7 ± 0.1 kcal/mole. This value is 10 kcal/mole less than the stabilization energy of the isoelectronic methylallyl radical. The difference in pi bond energies in the canonical forms of the methylacetony radical accounts for the variation in stabilization energies. (Author abstract modified)

10170

APTIC NO. 27700

Malinauskas, A. P.
FISSION PRODUCT DEPOSITION CHARACTERISTICS
IN THERMAL GRADIENTS.

In: Reactor Chemistry Division Annual Progress Report, Oak Ridge National Lab., Tenn., Reactor Chemistry Div., Contract W-7405-eng-26 Rept. ORNL-4229, p. 160-161, March 1968. 1 ref.

Development is described of mathematical models to support experiments in which thermal gradient tubes are used to identify and characterize gaseous fission product species. The experimental method, first advanced by Castleman, takes advantage of vapor pressure differences to effect separation of a multicomponent gas mixture by passing the mixture down a tube along which a temperature gradient is maintained. The particular model described takes into account only thermodynamic factors. Aside from the abrupt onset of deposition which is observed experimentally, this simplified description also correctly predicts the exponential character of the deposition profile.

10171

APTIC NO. 27747

Pesko, Karol

CONSTRUCTION OF TERNARY PLOT BY ESTIMATE
OF TERNARY PROPERTIES FROM BIUARY DATA.

(Konstrukcia ternarného diagramu odhadom ternarnej vlastnosti z binarných dát). Text in Czech. Chem. Průmysl (Prague), 14(2):71-73, 1964. 2 refs.

The method is described for construction of ternary diagram from the known data on binary systems. The method enables direct calculation of points with the same value of ternary property (e.g., of isotherms). The addition of a property in a ternary system is assured. As an illustration, the composition of the ternary mixture of acetic, monochloroacetic, and dichloroacetic acids, solidifying at 30 C, is calculated.

10172

APTIC NO. 27752

Holtzman, R. B. and F. H. Ilcewicz

TEN PB AND 210 PO IN WOOD AND THE CIRCULATION
OF LEAD IN TREES. (SIC.).

In: Radiological Physics Division Annual Report, Argonne National Lab., Ill., Radiological Physics Div., Rept. ANL-7615, p. 38-43, 1969. 12 refs.

Measurements of lead (210) and polonium (210) concentrations in tree rings from four 100-year-old trees were made in order to estimate the rates of radial translocation. Decrease of the concentration of the lead (210) with a 21.4-year half-life showed that there is little circulation of lead in hickory heartwood more than 20 years old. In oak there appears to be little circulation in wood less than 5 years old, but this conclusion is less reliable because of the low concentration of the lead (210) and the presence of radium (226). The concentrations of the polonium (210) correlated fairly well with those of the lead (210). Preliminary measurements of the stable lead concentrations did not show increased uptake in recent times. However, more detailed studies on the lead (210) and stable lead concentrations are needed to determine the value of the heartwood of trees as a temporal record of lead contamination of the environment. (Author abstract)

10173

APTIC NO. 27802

Spurny, K.

DEVELOPMENT AND ORGANIZATION OF AEROSOL
RESEARCH IN THE CSSR.

Czechoslovak Acad. of Sciences, Prague, Proc. Natl. Conf. Aerosols, 1st, Liblice, Oct. 8-13, 1962, p. 25-34. 5 refs.

In Czechoslovakia, the physical chemistry of aerosols is studied as an independent discipline. However, as a relatively new branch of science, there are still a large number of unsolved or partly solved problems which are important not only to physical chemistry but also to industry, military engineering, hygiene, and medicine. Specific examples of these problems are given, including the laws governing the settling and coagulation of particles and the physicochemical properties of the aerosol cloud. The problem of atmospheric contamination by aerosols of industrial or mining origin is also a topical question in Czechoslovakia. Research results obtained so far, as well as those planned, serve as a basis for technicians and hygienists to elaborate new or improved methods for fighting atmospheric pollution, controlling dust in working places, and applying aerosols in medicine and agriculture. At the same time, the modern physicochemical methods developed by the Institute of Physical Chemistry of the Czechoslovak Academy of Sciences are making possible continued experimental research in the field of aerosol mechanisms and filtration.

10174

APTIC NO. 27817

Kornfeld, Jack P.

MODELING AND ANALYSIS-NECESSARY PREREQUISITES TO EFFECTIVE AND REASONABLE CONTROL OF AIR POLLUTION.

Preprint, Air Pollution Control Assoc., Pittsburgh, Pa., 26p., 1970. 6 refs. (Presented at the Air Pollution Control Association, Annual Meeting, 63rd, St. Louis, Mo., June 14-18, 1970, Paper 70-16.)

The role of modeling in air pollution control programs is presented. Scientific and management models are necessary prerequisites to a cost-effective air pollution control program; mathematical models are essential to diagnosis, prediction, and evaluation as well as for the identification of program priorities. Three types of models are discussed: air quality models, control strategy models, and cost-effectiveness models. The relationship of these models to the air pollution measurement, control, and evaluation processes is depicted and discussed. Some of the possible parameters of these models are presented along with suggestions for their use. The need for considerably improved meteorological, receptor, and source data is emphasized. Shortcomings of present diffusion and prediction models are discussed. (Author abstract modified)

10175

APTIC NO. 27840

Goehring, Margot and Herakles-Wolfgang Kaloumenos

THE EFFECT OF SULFUR DIOXIDE ON AMMONIA.

Z. Anorg. Chem., vol. 263:137-144, 1950. 23 refs. Translated from German. 12p.

The disproportionation of sulfur dioxide subject to ammonolysis was investigated. The preparation of $\text{SO}_2\cdot\text{NH}_3$ at various temperatures is described. The hydrolysis of the $\text{SO}_2\cdot\text{NH}_3$ prepared at -20°C produced only ammonium ion and hydrogen sulfite ion. At higher temperatures, sulfate, trithionate, and thiosulfate appeared. A plot of the amount of hydrolysis product found showed it to be dependent on the temperature during the preparation of the $\text{SO}_2\cdot\text{NH}_3$. The hydrolysis of $\text{SO}_2\cdot\text{NH}_3$ prepared at 40°C or 50°C resulted in a precipitate of pure tetranitrogen tetrasulfide, N_4S_4 . When $\text{SO}_2\cdot\text{NH}_3$ was prepared at 50°C and heated up to 80°C , aminosulfonate and iminosulfonate, N_4S_4 , elemental sulfur, and dinitrogen tetrasulfide compound, N_2S_4 , were formed. The products of hydrolysis which have been described appear to point to the fact that sulfur dioxide is inclined to take part in a disproportionation reaction under the influence of ammonia which is not comparable with the analogous well-known sulfur trioxide reaction. t

10176

APTIC NO. 27847

Blyholder, George D. and Gordon W. Cagle

INFRARED SPECTRA OF H_2S , CS_2 , SO_2 , CH_3SH , AND $\text{C}_2\text{H}_5\text{SH}$ ADSORBED ON FE AND NI.

Environ. Sci. Technol., 5(2):159-161, Feb. 1971. 19 refs.

Infrared spectra over the spectral range 4000 to 450 reciprocal cm of the stable surface species formed at 25°C by the exposure of evaporated iron and nickel to hydrogen sulfide, carbon disulfide, sulfur dioxide, methyl mercaptan, and ethyl mercaptan were recorded. No infrared bands for adsorbed H_2S and CS_2 were detected on either Fe or Ni. For ethyl mercaptan on both Fe and Ni, bands at 1240, 1045, and 965 reciprocal cm are interpreted as indicating the C-C-S chain is intact in the adsorbed species. Interaction of SO_2 with Fe and Ni surfaces produces SO_4 surface species. (Author abstract)

10177

APTIC NO. 27836

Dean, A. M. and G. B. Kistiakowsky

OXIDATION OF CARBON MONOXIDE/METHANE MIXTURES IN SHOCK WAVES.

J. Chem. Phys., 54(4):1718-1725, Feb. 15, 1971. 19 refs.

Carbon monoxide/oxygen/argon mixtures with mole fractions of 4%/2%/94% and containing 180 or 500 ppm methane were investigated in incident shock waves at about 5 times 10 to the 12th power particles/cc total concentration. The reaction was followed by measuring infrared emissions from CO_2 and CO for about 1500 microsec particles time at 1750-2575 K. The rate of CO_2 production initially increased exponentially and then became constant after several percent conversion. A proposed 15-step mechanism for methane oxidation formed the basis for calculating (CO_2) -time profiles. Rate constants for each reaction were calculated with a numerical integration technique and then used to calculate the rate of CO_2 production later in the reaction. Agreement between observations and calculations is good, and the rate constants are considered more reliable than those calculated from measurements of the induction period rather than the period of exponential growth. The calculations show, however, that the thermal dissociation of methane must be included in the proposed mechanism. Methane is noted to be more effective than hydrogen or water in promoting the branching chain oxidation of CO. (Author abstract modified)

10178

APTIC NO. 27857

Chong, Shuang-Ling and J. L. Franklin

HIGH-PRESSURE ION-MOLECULE REACTIONS IN CARBON MONOXIDE AND CARBON MONOXIDE-METHANE MIXTURES.

J. Chem. Phys., 54(4):1487-1495, Feb. 15, 1971. 12 refs.

Ion-molecule reactions were studied by passing carbon monoxide alone, or carbon monoxide and methane, into the ion source of a quadrupole mass spectrometer. In the case of CO alone, the pressure was varied from 0.1 to 1.2 torr, and the relative intensities of the various ions are shown as a function of CO pressure. The primary ions observed were C positive, O positive, and CO positive above about 0.2 torr, C_2O_2 positive becomes detectable and rises rapidly to a constant value of about 50% of the sum of the ions formed. Traces of CO_3 positive and C_3O_2 positive were also observed. Rate constants for the various reactions occurring were determined. As pressure increases above about 0.2 torr, CO positive reacts in a three-body process to give C_2O_2 positive. Reaction mechanisms are also discussed. In the study of the CO- CH_4 mixtures, CH_4 was present in the source at a pressure of 0.22 torr, and CO was introduced in small increments. The principal ions present in the source at these conditions are CH_5 positive, C_2H_5 positive, and C_3H_5 positive, and thermochemistry of various possible reactions is considered.

10179

APTIC NO. 27870

Lassettre, Edwin N. and Ausma Skerbele

ABSOLUTE GENERALIZED OSCILLATOR STRENGTHS FOR FOUR ELECTRONIC TRANSITIONS IN CARBON MONOXIDE.

J. Chem. Phys., 54(4):1597-1607, Feb. 15, 1971. 39 refs.

The fourth positive bands of carbon monoxide are of considerable interest in a study of cross sections and oscillator strengths since a very large discrepancy (a factor of 2.6) was found between the extrapolated oscillator strengths obtained from measurements. By comparing inelastically and elastically

scattered electrons at 300, 400, and 500 eV kinetic energy, and using the elastic collision cross sections measured by Bromberg, generalized oscillator strengths have been measured for the v' equal to 2 level of the fourth positive bands of carbon monoxide. The high-resolution electron spectrometer developed for the accurate measurement of cross-section ratios is described, while the pressure of carbon monoxide in the collision chamber was constantly monitored with a capacitance manometer. Relative intensities are reported. At kinetic energies of 200 eV and higher, the relative intensities are essentially constant when the scattering angle is greater than 1 deg and at lower kinetic energies are constant at all angles to within experimental error. Possible variation in relative intensities with scattering angle is discussed. A possible reason is given for the large discrepancy between the oscillator strength obtained for the entire fourth positive band from electron impact and from lifetime measurements by other investigators.

EFFECTS-HUMAN HEALTH

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APTIC NO. 21125

VDI (Verein Deutscher Ingenieure) Kommission Reinhaltung der Luft, Düsseldorf, Germany

PERMISSIBLE CONCENTRATIONS OF NITROUS GASES.

(Maximale Immissions-Konzentrationen MİK Nitrose Gase). VDI (Ver. Deut. Ingr.) Richtlinie, no. 2105, May 1960. 24 refs. Translated from German. 9p., 1962.

The Permissible Emission Concentrations, (PEC values) set by VDI are defined as those concentrations of pollutants in layers of the open air close to the ground which may be considered harmless, according to current knowledge, to man, animal, or plant during exposure of a given frequency and duration. These values are valid only within certain ranges, only when the pollutant occurs by itself rather than in mixture with other pollutants, and only for the open air outside of an emitting location. Nitrous gases occur in nature from electric discharges in the atmosphere; technologically, they are produced from such principal sources as the manufacture and processing of nitric acid and from internal combustion engines, explosives, and celluloid. Nitrous gases, which are recognizable by their brown color and characteristic odor, comprise the following nitrogen oxides and their compounds: nitrogen monoxide (NO); dinitrogen trioxide (N₂O₃); nitrogen dioxide (NO₂); and dinitrogen tetroxide (N₂O₄). The latter two are the primary carriers of the toxic action of nitrous gases. The PEC half-hour mean value set for continuous exposure to NO₂ is 0.5 cm³/m³. The PEC for intermittent exposure (permissible excess above the PEC for continuous exposure) is 1.0 cu cm/cu m half-hour mean value, three times daily. In the transition from normal air into an atmosphere containing NO₂, the olfactory threshold lies at 0.1 cu cm/cu m (calculated as NO₂) and the odor becomes characteristic at 0.5 cu cm/cu m, although within 5-6 min olfactory perception disappears even at 20 cu cm/cu m. Minor symptoms of irritation such as dry and rough throat may occur under prolonged inhalation of 1-2 cu cm/cu m; with repeated exposure, these become less and finally disappear even after inhaling 20 cu cm/cu m for 2 hrs. Toxic effects of nitrous gases on man and animals have not been differentiated; in plants, it appears that even sensitive plants sustain no damage from exposure to a mean concentration of 1 to 2 cu cm/cu m.

10181

APTIC NO. 24629

Falk, Hans L., Paul E. Steiner, Sam Goldfein, Alexander Breslow, and Ruth Hykes

CARCINOGENIC HYDROCARBONS AND RELATED COMPOUNDS IN PROCESSED RUBBER.

Cancer Res., 11(5):318-324, May 1951. 17 refs.

During the construction of a chemical apparatus in which ground glass connections could not be used because of the large size of the flasks, benzene extracts of rubber stoppers previously washed with ether and methanol still contained blue-green fluorescing substances. These extracts had the ultraviolet absorption spectra of carcinogenic hydrocarbons and other compounds of interest. This discovery seemed of such great possible importance to investigators in cancer research, to the rubber industry, and to public health that further experiments were made. A benzene extract of rubber stoppers was carcinogenic by skin painting in mice. From such extracts of rubber stoppers and of an automobile tire, eight aromatic hydrocarbons were isolated. 3,4-Benzpyrene, pyrene, chrysene, and alkyl cyclopentenophenanthrene were identified beyond reasonable doubt by their ultraviolet absorption spectra, and, additionally, in the case of pyrene and chrysene by melting point determinations. The identity of another crystalline product, 1,12-benzperylene, seems fairly certain. The oily nature of three products, 1,2-benzpyrene, alkyl pyrene, and alkyl 1,2-benzanthracene made definite identification impossible. 3,4-Benzpyrene, 1,2-benzpyrene, pyrene, and chrysene are described as carcinogenic in the literature. The other four compounds are structurally related to carcinogenic compounds. The possible importance of these observations to workers in the industries concerned, to the general public, and to cancer research is discussed. (Author summary modified)

10182

APTIC NO. 27706

Corn, Morton, Nancy Kotako, Dolores Stanton, William Bell, and Armand P. Thomas

PATHO-PHYSIOLOGIC RESPONSE TO SINGLE AND MULTIPLE AIR POLLUTANTS IN HUMANS AND ANIMALS. (FINAL REPORT).

NAPCA Contract PH-86-67-73, APTD-0593, 125p., July 1, 1970. 45 refs.

NTIS: PB-195-888

Twenty healthy, adult male cats were lightly anesthetized (Nembutal), tracheotomized, and were then subjected to a Harvard pump at a fixed frequency and tidal volume. Purified Medical Grade breathing air with or without sulfur dioxide in air or sulfur dioxide in combination with sodium chloride aerosol in air was delivered to the animals in predetermined exposure sequences and for fixed durations of time. Parameters of response used to judge adaptation of cats to the inhaled challenges of pollutants were pulmonary flow resistance and lung compliance. Each animal acted as his own control. In addition, pollutant mixtures were delivered to animals via endotracheal catheter and/or face mask to evaluate the possible influence of receptors which may be present in the nasopharyngeal chamber and in the trachea above the tracheal cannula. After selected exposures, the pleural cavity was opened and liquid Freon was used to freeze the lungs. Procedures were developed to obtain histological sections in order to measure changes in airway size. The major finding was the variability of the responses of the test animals. Certain subjects showed increased pulmonary flow resistance at low SO₂ concentrations, and were the analogues of the 'reactors' in human populations. Approximately 20 ppm SO₂ in air was required to

evoke a significant change in pulmonary flow resistance in 'reactors'. The majority of animals showed no response at the concentration of SO₂ in air, either alone or in the presence of sodium chloride aerosol (10 mg cu m). When the pollutants were administered via endotracheal catheter and face mask, an increased frequency of significant changes in pulmonary flow resistance in these animals was suggested, as compared to animals receiving challenges by tracheal cannula. All alterations in parameters of response were reversible shortly after exposure ceased. This finding in cats is similar to reports of early reversal of these parameters in spontaneously breathing human subjects exposed to the same pollutants. In guinea pigs, pulmonary flow resistance, which was elevated by exposure to pollutants, returned to normal after a prolonged period (at least one hour) following cessation of exposure. Morphological examination of lung tissue sections after rapid freezing with Freon indicated that measurement of alterations in airway size is not possible in the range of changes of pulmonary flow resistance reported here. Methods and data for all experiments are presented in detail. (Author summary modified)

10183

APTIC NO. 27725

Clayton, George D., Warren A. Cook, and W. G. Fredrick
A STUDY OF THE RELATIONSHIP OF STREET LEVEL CARBON MONOXIDE CONCENTRATIONS TO TRAFFIC ACCIDENTS.

Traffic Safety Res. Rev., 4(4):25-31, Dec. 1960. 2 refs.
(Presented at the Annual Meeting of the American Industrial Hygiene Assoc., 20th, Chicago, Ill., April 1959.)

Studies were made to determine whether carbon monoxide-induced disturbances of vision and reflexes could exert a causal influence on automobile accidents in the Detroit area. Concurrently, conditions necessary to create excessive atmospheric CO concentrations were investigated. At four sampling sites a high correlation by hour of day was found between CO and traffic density, but hourly percentage changes in traffic densities did not imply equivalent changes in CO concentration. Variations in CO concentrations were due also to temperature inversion effects and wind speed. Attempts to correlate CO inside a car to percent carboxyhemoglobin yielded only a slight rise in blood CO content during a sampling day when CO inside a car averaged 17 ppm. The rise was 0.8-1.2% COHb for nonsmokers and 3.1-3.9% for smokers. Based on data for 4052 consecutive automobile accidents, occupational exposure to CO does not appear to influence driving ability. Of 237 blood samples from traffic accident victims, 50% were below 2.0% COHb saturation and only three samples showed saturation in excess of 10%. These findings suggest that CO concentrations in urban areas are not a factor in impairing driving ability.

10184

APTIC NO. 27753

Talvitt, N. A. and Lial W. Brewer

SEPARATION OF FLUORIDE BY ION EXCHANGE: APPLICATION TO URINE ANALYSIS.

Am. Ind. Hyg. Assoc., J., 21(4):287-295, Aug. 1960. 15 refs.
(Presented at the American Industrial Hygiene Assoc. Annual Meeting, 21st, Rochester, N. Y., April 25-28, 1960.)

Two ion-exchange procedures are described which provide simple, low-cost alternatives to the distillation process for the separation of fluoride from urine. The first procedure involves the elution of fluoride from hydroxide resin with hydroxide ion, the second the elution of fluoride from acetate resin with beryllium ion. The results obtained with the first procedure are in close agreement with those obtained by distillation, while the results obtained with the second procedure are consistently

higher than those for distillation. Both methods permit the simultaneous processing of a large number of samples and the attainment of an over-all rapidity of analysis. Because the second procedure has a low level of background interference, it is particularly suitable for evaluating control measures for protecting industrial populations in which the fluoride excretion level at times exceeds tenfold the normal.

10185

APTIC NO. 27755

Rowley, R. J. and G. H. Farrah

DIFFUSION METHOD FOR DETERMINATION OF URINARY FLUORIDE.

Am. Ind. Hyg. Assoc., J., 23(4):314-318, July-Aug. 1962. 8 refs. (Presented at the Pittsburgh Conference on Analytical Chemistry and Applied Spectroscopy, Pittsburgh, Pa., March 5, 1962.)

A modified diffusion procedure is presented for analyzing urinary fluoride. No preliminary treatment is required and operator time is greatly reduced since samples can be conveniently processed in large groups. A 1 ml portion of specimen is placed in a plastic Petri dish containing a chloride fixative. The sample is acidified and the dish closed with a cover coated on the inner surface with sodium hydroxide. After diffusion for 20 hrs at 50 C, fluoride in the caustic film is colorimetrically measured by the Thorium-Alizarin Red S method or the Zirconium-Eriochrome Cyanine R method. Absorbance of fluoride against water is then determined spectrophotometrically at a wave length of 525 micrometers. Conversion to micrograms of fluoride is made by means of a corresponding calibration curve. Within the range 0-25 micrograms F/ml the precision and accuracy of this method are comparable to those of the distillation procedure. (Author abstract modified)

10186

APTIC NO. 27756

Booth, F. J.

CASES OF LUNG INJURY FOLLOWING EXPOSURE TO BLAST AND NITROUS FUMES.

Aust. N. Z. J. Surg., vol. 12:72-73, July 1942.

Several cases of lung injury following exposures to a severe blast and the nitrous fumes of burning cordite are described. Attention is drawn to the difficulty in differentiating between pulmonary concussion or blast lung and poisoning from nitrous fumes in the absence of a clear history. The importance of bearing in mind the possibility of multiple lesions in conditions resulting from high explosives is illustrated. In the initial stages of injuries of this nature anoxia dominates the clinical picture, and the only way of combating this is by the adequate administration of oxygen, controlled by accurate observations of the mental state, the pulse rate, and the presence or absence of cyanosis. An interesting point was the slight effect of oxygen in diminishing the ventilation rate of the lungs. As in the case of left heart failure, this is probably due to the fact that the dyspnea is mainly reflex in origin from the congestion of the pulmonary bed and not due to changes in the carbon dioxide or oxygen tensions of the blood. The very real risk of a superimposed bacterial infection must be constantly borne in mind in the treatment of these injuries.

10187

APTIC NO. 27758

Adley, Frank E.

EXPOSURES TO OXIDES OF NITROGEN ACCOMPANYING SHRINKING OPERATIONS.

J. Ind. Hyg. Toxicol., 28(1):17-20, Jan. 1946. 1 ref.

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Use of large oxyacetylene shrinking torches, particularly in small, unventilated compartments, can produce dangerous concentrations of oxides of nitrogen. Under the conditions encountered it was found that excessive exposures can accumulate within a period of a few minutes. Contact of the flame with cold water or cool metal was found to have no noticeable bearing on the production of oxides of nitrogen. A close correlation was found to exist, however, between the production of this gas and the rate of consumption of acetylene gas by the torches. Excessive concentrations were present in the breathing zone of the operators working in confined spaces with all sizes of torch tips investigated; those of large capacity producing the highest concentrations. Contrasting tests obtained at shrinking operations in large, ventilated spaces showed that the resulting concentrations of oxides of nitrogen were noticeably less, although in some instances still excessive. Several tests for carbon monoxide failed to indicate the presence of any health hazard from this gas even in confined, unventilated spaces. The collecting medium was a sulfuric acid-hydrogen peroxide solution, and the subsequent analyses were made by the phenoldisulfonic method. (Author conclusions)

10188

APTIC NO. 27759

Schulte, John H.

THE 1960 WELLCOME PRIZE ESSAY--THE MEDICAL ASPECTS OF CLOSED CABIN ATMOSPHERE CONTROL.

Military Med., 126(1):40-48, Jan. 1961. 6 refs.

During a 72 day submerged cruise, one hundred and eight healthy adult males between the ages of 17 and 37 years were exposed to a controlled closed cabin atmosphere aboard an operating nuclear submarine. The atmosphere had an average consistency of 19.7% oxygen, 1.04% carbon dioxide, 1% hydrogen, 44 ppm carbon monoxide, 15 ppm freon-12, and approximately 78% nitrogen. It occasionally contained small amounts of ammonia, chlorine, and aromatic hydrocarbons. As measured by hemoglobin and hematocrit determinations, exercise tolerance tests, general appearance, vital signs, body weight, and caloric requirements, no change was observed in the general health status of the crew. The decreased incidence in upper respiratory infections and concomitant changes in white blood cell and differential counts is the result of small community isolation rather than atmosphere control. A decrease in occurrence of gastrointestinal disease and injuries is not attributable to the closed cabin atmosphere either, but results from the nuclear submarine's ability to remain submerged thus avoiding the rolling and pitching action caused by wave motion on the surface of the ocean. (Author conclusions modified)

10189

APTIC NO. 27760

Riggs, Helena E.

PATHOLOGIC CHANGES IN THE NERVOUS SYSTEM.

Ind. Med., 14(4):285-287 April 1945. 15 refs.

Much of the confusion concerning the reaction of nerve tissue to chemical agents stems from attempts to establish inflexible criteria of intoxication formulated on the assumption that the nature of the offending substance determines the clinical expression of neural involvement. The similarity of reaction occasioned by such variety of noxious stimuli suggests that toxic substances in general influence the nervous system primarily through their effect upon physiologic equilibrium and that the resulting alterations in nerve cell metabolism, rather than the intoxicating agent, determine the extent of neural damage and

its clinical expression. Clinical expressions of neural dysfunction cannot be considered so much diagnostic of the intoxicating agent as indicative of the degree of environmental change and the relative vulnerability of individual components of the nervous system to such disturbances. Cells with the most complex organization, and, therefore, the highest metabolic requirements, would be most sensitive to modification of physiologic equilibrium, and areas with relatively inadequate vascular drainage more vulnerable than those where more rapid elimination of abnormal conditions occurs.

10190

APTIC NO. 27797

Knobloch, Siegfried, Lothar-H. Engels, and Gies Hiedermanns THE INDUSTRIAL DUST SITUATION IN GRAVEL OPERATIONS IN THE FEDERAL GERMAN REPUBLIC.

(*Die Staubtechnische Situation in den Kieswerken der Bundesrepublik Deutschland*). Text in German. *Staub-Reinhalt. Luft*, 30(12):506-511, Dec. 1970.

Of 2225 sand and gravel pits operating in West Germany, 773 ship material without processing and consequently without generating dust. Another 1166 enterprises process material in either wet or moist form and generate no dust. The remaining 286 gravel pits produce silica dust of a consistency and concentration requiring control. The comparatively small percentage of these latter enterprises comprises the biggest and most productive gravel pits. The amount of dust generated by the individual enterprises was determined gravimetrically by the Gravicon device. The share of fine dust generated by crushers was found to be much larger than that generated by the sieves while the total dust concentration was the same. Altogether, 105 cases of silicosis have been reported from 37 enterprises (12.9% of all such hazardous enterprises). Of the various control measures tried and instituted the most effective was the precipitation of dust by spraying with water which did not permit the dust to rise to the respiration level. The average silica content in fine dust varies with the geological and mineralogical composition of the stone, and data gathered by dust concentration measurements make possible the assessment of dust conditions in gravel pits of different types.

10191

APTIC NO. 27801

Davis, Wayne H.

POLLUTION: WHENCE AND WHITHER.

Arch. Environ. Health, vol. 21: 3-4, July 1970. 4 refs.

Earth is the test tube and as numbers of people continue to rise, pollution and other toxic products of our civilization will destroy the entire ecosystem. Mercury, lead, carbon monoxide, oxides of sulfur and nitrogen, pesticides, herbicides, and radioactive wastes are some of the toxins which have already caused serious trouble. The most important factor concerning a toxin is concentration. Concentrations of DDT and its metabolites in the environment have nearly eliminated the brown pelican, Bermuda petrel, osprey, peregrine falcon, and the eastern bald eagle. A fundamental law of ecology is that the more species in a community the more stable it is. The starfish population explosion which is destroying the coral atolls and threatening wave erosion loss of islands from Hawaii to Australia probably results from man's effects on the ecosystem, most likely his use of DDT. Concentrations of a few parts per billion of DDT inhibit photosynthesis in marine algae. Such algae not only are the base of the food chain upon which marine animals are dependent, but they also provide most of our oxygen. The food production advocates say that the underdeveloped nations must increase pesticide usage six-

fold in order to feed themselves. Since these nations are the poorest and DDT the cheapest, that pesticide will be used. Rise in the human population means destruction to all.

10192

APTIC NO. 27814

Ziakind, Morton M., Hans Weill, and Ronald B. George
DIFFUSE PULMONARY DISEASES.

Am. J. Med. Sci., 254(1):95-117, July 1967. 234 refs.

The usefulness of a roentgenographic classification in approaching the diversity of diffuse pulmonary diseases has been stressed. This approach is based upon the presence of predominant acinar or interstitial changes and divides diffuse pulmonary diseases into groups, each of which contains a limited and manageable number of diseases. During the past few years, a great variety of manifestations of these diseases has been reported; a new disease, desquamative interstitial pneumonia, has been described and an increased incidence of other disorders such as Goodpasture syndrome has been observed. The great value of pulmonary function studies, notably the carbon monoxide diffusion test, in determining the presence and course of a diffuse pulmonary disease has been established. Steroid therapy continues to have broad application in diffuse pulmonary diseases and raises questions concerning the duration of its beneficial effect. Experience with lung biopsy has greatly increased but the proper place for this procedure is still under discussion in diseases that may produce extrapulmonary lesions. (Author summary)

10193

APTIC NO. 27816

Lowry, Thomas and Leonard M. Schuman

'SILO-FILLER'S DISEASE'-A SYNDROME CAUSED BY
NITROGEN DIOXIDE.

J. Am. Med. Assoc., 161(3):153-160, Sept. 15, 1956. 18 refs.

Four patients who entered silos within a day or two after filling with corn silage noted irritating fumes and experienced respiratory symptoms of varying degrees of severity. A period of failure to improve was followed by a period of worsening that ended with death on the 27th and 30th days in two cases. The disease was halted in the other two cases by treatment with prednisone. Intramuscular injections of this drug in 10 mg doses three times daily were followed by prompt and striking improvement, especially in one case. Chemical evidence showed that the toxic gas was probably nitrogen dioxide, a gas capable of causing early pulmonary edema with subsequent bronchiolitis fibrosa obliterans. The bronchiolitis gives a roentgenogram marked by innumerable discrete nodular densities in the lungs and indistinguishable from that of acute miliary tuberculosis; its nature was verified at autopsy in the two fatal cases. Oxygen gave only symptomatic improvement, and the effects of bronchodilators and antibiotics were only temporary. Prevention of silo-filler's disease depends on adequate ventilation, on means of keeping people and animals from straying into dangerous spaces adjoining a silo, especially during the 7 to 10 days after the silo is filled, and on a wider recognition of the danger. (Author abstract)

10194

APTIC NO. 27826

Satsura, Yu. D.

ELECTRON-MICROSCOPIC INVESTIGATION OF
PENETRATION OF COPPER OXIDE AEROSOL FROM
THE LUNGS INTO THE BLOOD AND INTERNAL
ORGANS.

Bull. Exp. Biol. Med. (USSR) (English translation from Russian of: *Byul. Eksperim. Biol. i Med.*), 68(10):1175-1178, Oct. 1969. 10 refs.

Albino rats were exposed to 50-80 mg/cu m of copper oxide dust for 15, 20, 35, and 60 min or three hours. As determined by electron microscope analysis of the lungs of the animals, copper oxide crystals ultimately penetrated the air-blood barrier and were introduced into the capillary lumen of the alveolar wall, ultrastructures of the alveolar cells, and the ground substance of the connective tissue of the alveolar septa. Edema and swelling of the ultrastructures of the lung cells were observed and attributed to disturbance of capillary permeability.

10195

APTIC NO. 27828

Hayashi, Seizaburo

BRONCHIAL ASTHMA CAUSED BY DIFOLTAN, N-(1,1,2,2-TETRACHLOROETHYLTHIO)- 4-CYCLOHEX-
ENE-1,2-DICARBOXIMIDE.

(*Difoltan ni yoru kikanshizensoku no shori*). Text in Japanese. *Noson Igaku* (J. Japan. Assoc. Rural Med.), 18(4):196-197, March 1970.

Six patients were studied over three years in Shizuoka Prefecture with respect to bronchial asthma, apparently caused by Difoltan sprayed in orange orchards. For all cases, the relationship of the affliction with Difoltan was quite evident, and the attacks had all occurred in the evening of the day of spraying, or in the evening of the day when the patients worked in the orchard that had been sprayed with Difoltan. The following characteristics of the afflictions were observed. For the first year, there was no manifestation of symptoms, even if the patients took part in Difoltan spraying. The attacks first occurred after two to three years subsequent to the first contact with the chemical. Not only spraying alone, but also working in the sprayed field caused attacks. The patients were mainly of high age groups, and none was observed among twenty to forty-year-olds. Of the five X-ray examinations, one case showed an inflammation of the lungs apparently due to Difoltan.

10196

APTIC NO. 27836

Inoue, Tetsuzo and Yasukiyo Tsubaki

CLINICAL AND STATISTICAL INVESTIGATIONS OF
NOSE, LARYNX AND TRACHEA OF SEAMEN IN
CARGO BOATS AND OIL TANKERS.

(*Kamotsusen oyobi oiru tanka join no bi-inku oyobi into, kikan no rinsho tokeiteki kansatsu*). Text in Japanese. *Nihon Kikan Shokudoka Gakkai Kaiho* (J. Japan Broncho-Esophagological Soc.), 21(3):117-123, June 1970. 7 refs.

Respiratory system examinations were conducted among 160 seamen from cargo boats and oil tankers. The subjects included 73 deckmen and 62 engineers. Advanced chronic inflammation of the pharyngeal mucous membrane was found in 8.8% of the engineers, 67.2% of the deckmen, and 72.0% of the remaining 25 crew members. Laryngeal mucosa was edematous, erythematous, and polypoid in 63% of the engineers, 40% of the deckmen, and 32% of the remaining subjects. Similar data were obtained for the tracheal mucous membrane. With respect to the nasal mucous membrane, no distinct differences were observed among the three groups. The findings indicate a short-acting, reversible irritation of the upper respiratory mucous membrane in deckmen and a long-acting, irreversible irritation in the case of engineers. Suggestions are made for ventilation of the engine room. (Author abstract modified)

10197

APTIC NO. 27859

Brodine, Virginia

A SPECIAL BURDEN.

Environment, 13(2):22-24, 29-33, March 1971. 2 refs.

EFFECTS-HUMAN HEALTH

10200

An analysis of the deaths that occurred in Chicago each day during January 1966 indicated no significant rise in female deaths with increased air pollution but suggested an increase in the death rate among males 55 and over when sulfur dioxide was between 0.17 and 0.29 ppm. When the mortality and pollution data were related to race and socioeconomic data, a revealing picture emerged. The dividing line between increase and no increase in deaths continued to be between 0.17 and 0.29 ppm for whites and between 0.12 and 0.24 ppm for the high socioeconomic group. However, it was only when SO_2 was 0.34 or higher that a significant increase was shown in either the nonwhite or the low socioeconomic group. The results are interpreted as implying that high levels of pollution can precipitate illness or death in less susceptible, more resistant individuals. The most susceptible individuals, e.g., the poor and nonwhites, are killed by a combination of illness and environmental factors including the usual levels of pollution in the areas where they live. An adaptive ability induced by constant exposure to high levels of pollution is suggested. Other urban contaminants, whose effects are described, are asbestos and benzpyrene.

10198

APTIC NO. 27865

Merkle, C. R., Jr.

KEY ELEMENTS OF AN EFFECTIVE RESPIRATORY PROTECTION PROGRAM.

Environ. Control Safety Management, 141(3):16-20, March 1971.

Guidelines for a successful respiratory protection program comprise responsibility and authority for administration, knowledge of respiratory hazards, hazard assessment and control, selection of protective equipment, training, maintenance of the equipment, and medical surveillance. Oxygen deficient air and air laden with contaminants are the two basic respiratory hazards. While 16% oxygen is generally considered the lower limit for safe human exposure, the partial pressure of oxygen within the lung is the important factor. Particles below 10 micron in diameter have a greater opportunity to enter the respiratory system, and particles below five micron in diameter are more apt to reach the deep lung or alveolar spaces. Gaseous contaminants exist as true gases such as sulfur dioxide, hydrogen sulfide, carbon monoxide, etc., or as vapors from organic liquids such as ethyl ether, carbon tetrachloride, benzene, and others. In the latter case the vapor pressure or volatility of the liquid determines the degree of exposure hazard. The degree of effect of both gaseous and particulate contaminants depends both largely upon the airborne concentration and the amount of exposure. Accordingly, a listing of Threshold Limit Values is published yearly by the American Conference of Governmental Industrial Hygienists as a guide to exposure concentration for a certain period of time. Sampling for hazard assessment is indicated, as well as knowledge of involved processes, related equipment, raw materials and end-products. Basic types of air purifying devices include mechanical filter respirators, chemical cartridge respirators, and gas masks. Supplied air devices are air-line respirators, and hose masks, while self-contained breathing apparatus comprise an oxygen cylinder rebreathing type, a chemical oxygen rebreathing type, and a demand type. Education for the use of any respiratory protective device is mentioned, and inspection and maintenance of the protective equipment are discussed.

EFFECTS-PLANTS AND LIVESTOCK

10199

APTIC NO. 20979

Metcalfe, James, Waldemar Moll, Heinz Bartels, Peter Hilpert, and Julian T. Parer

TRANSFER OF CARBON MONOXIDE AND NITROUS OXIDE IN THE ARTIFICIALLY PERFUSED SHEEP PLACENTA.

Circulation Res., 16(2):95-101, Feb. 1965. 7 refs.

The sheep placenta was perfused in situ through the umbilical circulation with a dextran solution containing carbon monoxide and nitrous oxide in order to provide evidence upon the existence of a countercurrent system of maternal and fetal blood flow. Carbon monoxide concentration in the perfusion fluid after passage through the umbilical circulation was 19 plus or minus 3% of its concentration in the entering perfusion fluid, representing shunted umbilical flow or the amount which does not exchange substances with the maternal blood. The concentration of nitrous oxide in the perfusion fluid after passing the placental membrane and before admixture of shunted perfusion fluid was 14 plus or minus 4% of its original concentration when the maternal arterial concentration was zero. It is concluded that the perfusion fluid did not at any time reach the maternal arterial concentration and that no functionally effective countercurrent flow pattern exists in the sheep placenta. Reversal of the flow direction in the fetal umbilical vessels resulted in a slight increase of the N_2O concentration in the perfusion fluid after passing the placental membrane and before admixture of the shunted perfusion fluid. The placenta is suggested to contain a mixture of countercurrent and concurrent flow units, and diffusion of gases along the capillaries within the comparatively thick placental membrane of the sheep is also considered as a possibility. (Author summary modified)

10200

APTIC NO. 21072

Abeles, F. B.

ROLE OF RNA AND PROTEIN SYNTHESIS IN ABSCISSION.

Plant Physiol., 43(9), Part B:1577-1586, Sept. 1968. 60 refs.

The role of RNA and protein synthesis in abscission are discussed in terms of a model system, in an effort to construct a hypothesis and examine the available data to see how well they fit the model. Abscission is defined as the process of shedding or separating plant parts, including leaves, stems, fruits, and flowers. The cell separation aspect of abscission is thought to involve the action of specific cell wall degrading enzymes. The hormone responsible for the induction of these enzymes is ethylene, which normally is continuously produced by the explant; the role of ethylene is considered in detail. Enzymes represent synthesis, which in turn is preceded by the synthesis of specific RNA molecules, and it follows that inhibition of either of these processes would also block abscission. Since abscission is a localized phenomenon usually involving two or three cell layers, RNA and protein synthesis should also be localized. Manipulations of plant material which either accelerate or retard abscission may be due to the regulation of RNA and protein synthesis. (Author abstract modified)

10201

APTIC NO. 21679

Hawksworth, D. L. and F. Rose

QUALITATIVE SCALE FOR ESTIMATING SULPHUR DIOXIDE AIR POLLUTION IN ENGLAND AND WALES USING EPIPHYTIC LICHENS.*Nature*, vol. 227:145-148, July 11, 1970. 22 refs.

A method for estimating sulfur dioxide concentration by studying the lichens growing on trees is described. Ten generalized zones are defined, based on the luxuriance and number of species present. The method is designed for use on deciduous trees with rough bark with low pH, in open situations on which nitrophilous communities have not developed. Woodlands and ravines represent special cases, and must be considered differently. Trees to be studied must conform to a number of parameters, including size, quantity, location, and environmental conditions. The method is intended to be preliminary, although estimates based on epiphytic vegetation are perhaps more significant indicators of effective levels of air pollution than quantitative chemical measurements made a particular time, for lichens grow so slowly and live so long that the communities present can be considered in equilibrium with their environment.

10202

APTIC NO. 21686

Taylor, O. Clifton and David C. MacLean

NITROGEN OXIDES AND THE PEROXYACYL NITRATES.

In: *Recognition of Air Pollution Injury to Vegetation: A Pictorial Atlas*. Jay S. Jacobson and A. Clyde Hill (eds.), Pittsburgh, Pa., Air Pollution Control Assoc., 1970, p. E1-E14. 23 refs.

The effects of nitrogen oxides and peroxyacyl nitrate (PAN) on vegetation are discussed. The susceptibility of some plants to nitrogen dioxide induced is shown in tabular form. Continuous exposure of pinto bean and tomato plants for 10-22 days to 0.5 ppm NO₂ suppressed growth without attendant foliar lesions. Acute foliar markings produced by high-concentration NO₂ exposures are characterized by water-soaked lesions in the upper leaf surface, followed by rapid tissue collapse. Gradually, these lesions extend through the leaf and produce small necrotic patches. External factors reported to affect plant sensitivity to NO₂ include soil moisture, light, and relative humidity. No visible symptoms of leaf injury from nitric oxide have been reported. It is thought that NO may cause growth suppression without detectable leaf symptoms. Young plants are more susceptible to PAN than older plants of the same species. Peroxypropionyl nitrate (PPN) is several times more toxic than PAN, and peroxybutyl nitrate (PBN) is more toxic than PPN, but no differences in injury symptoms produced by the three compounds have been noted. PAN injury develops on three or four rapidly expanding leaves of a sensitive species. Injury appears at the apex of the youngest leaf, as a diffuse band across the intermediate-aged leaf, and at the base of the oldest leaf. Total collapse and necrosis of sensitive leaf tissue occurs when susceptible plants are exposed to high concentration. Incipient chlorosis develops and the injured area becomes flaccid.

10203

APTIC NO. 21689

Hill, A. Clyde, Howard E. Heggstad, and Samuel N. Linzon
OZONE.

In: *Recognition of Air Pollution Injury to Vegetation: A Pictorial Atlas*. Jay S. Jacobson and A. Clyde Hill (eds.), Pittsburgh, Pa., Air Pollution Control Assoc., 1970, p. B1-B22. 47 refs.

Ozone probably causes more injury to vegetation than any other air pollutant in the United States. Varietal and species differences in ozone sensitivity have been observed. Some of the species which have been injured in the field or which have appeared sensitive in fumigations are listed. The most common symptom on many deciduous trees and shrubs is localized thickening and pigmentation of the cell walls resulting in sharply defined small dot-like lesions. Small unpigmented necrotic spots or more general upper-surface bleaching is a common type of injury on most herbaceous and many wooded species. When all of the tissue of the leaf is killed, relatively large bifacial necrotic areas develop. Necrotic tissue ranges from white to orange-red depending on the species. On leaves with palisade parenchyma, chlorotic lesions are usually limited to small groups of palisade cells, and the injury is observable primarily on the upper leaf surface. Grasses with undifferentiated mesophyll may develop a fine chlorotic stippling on either surface. Chlorotic mottling and flecks are the common symptoms on pine. Symptoms of ozone injury on selected species are also discussed.

10204

APTIC NO. 25249

Pyatt, F. Brian

LICHENS AS INDICATORS OF AIR POLLUTION IN A STEEL PRODUCING TOWN IN SOUTH WALES.*Environ. Pollut.*, 1(1):45-56, July 1970. 26 refs.

The lichen flora of a given region depend on a multiplicity of factors, some of which act directly or indirectly on the lichen thallus. In addition, the lichen thallus is capable of exerting a modifying influence on the macro and micro-environment. The polluted center of Port Talbot, a steel town, has a restricted number of crustose and rather depauperate species. This 'lichen desert' is quite small, possibly because the atmosphere is not heavily polluted or because there is a rapid dilution of pollutants. With distance away from Port Talbot there is an increase in the number of lichen species and a change in the proportion of the various growth forms. Abutting the 'lichen desert' is a zone in which *Parmelia sulcata*, *P. saxatilis*, *Cladonia coniocraea*, and *C. fimbriata* are the most widely represented species. This is followed by a further zone dominated by *Usnea comosa*, *U. florida*, *Cetraria glauca*, and *Cladonia impexa* in particular. It must be emphasized that the zones are not clearly defined: there is a gradation in growth forms and a gradual change in the abundance of various species. (Author abstract modified)

10205

APTIC NO. 27805

Pack, Merrill R.

EFFECTS OF HYDROGEN FLUORIDE ON BEAN REPRODUCTION.

Preprint, Air Pollution Control Assoc., Pittsburgh, Pa., 20p., 1970. 12 refs. (Presented at the Air Pollution Control Association, Annual Meeting, 63rd, St. Louis, Mo., June 14-18, 1970, Paper 70-134.)

Tendergreen bean plants were grown from planting to seed maturity under continuous exposure to hydrogen fluoride at fairly uniform concentrations averaging 10.5, 9.1, and 2.1 micrograms F/cu m. Progeny of these plants and of comparable control plants were grown in a clean atmosphere to determine if subsequent generations were affected by HF treatment of the parents. The F-1 generation progeny of the HF treated plants were less vigorous than control plant progeny, as shown by later emergence, smaller primary leaves, and slower stem growth. This probably was a consequence of the lower starch content of the seed of the HF treated plants. The primary leaves of some of the HF treatment F-1 progeny were severely

EFFECTS-PLANTS AND LIVESTOCK

stunted and distorted. This also may have been due to the low starch content of the seed, or perhaps it resulted from damage to the plumules in shrivelled, distorted seed produced in the HF treatment. Some of the first trifoliolate leaves of many F-1 generation progeny of the HF treated plants were abnormal in the separation and number of their leaflets. This abnormality apparently was heritable, for in the next (F-2) generation it occurred most frequently among plants whose parents were abnormal. However, few F-3 generation plants had abnormal trifoliolate leaves, indicating rapid reversal to normal form. (Author abstract)

10206

Stefan, K.

THE INFLUENCE OF FERTILIZATION ON THE TOTAL SULFUR CONTENT OF SPRUCE(FIR) NEEDLES.

(Die Beeinflussung des Gesamtschwefelgehaltes von Fichtennadeln durch Dungung). Air Pollution Proc., First European Congr. Influence Air Pollution Plants Animals, Wageningen, Netherlands, 1968. 1 ref. Translated from German. Data Methods Corp., Denver, Colo., 4p., Oct. 9, 1970.

An experimental program designed to determine the effect of fertilization on the sulfur content of spruce needles is described. Needles taken from trees damaged by sulfur dioxide were analyzed to determine the characteristics of the sulfur content. The natural sulfur content of needles and its variation were determined before the fertilization process was begun. Fertilizers of two types, nitrogenous and sulfurous, were applied to controlled groups of trees. The change in sulfur content of the needles as a result of the sulfurous fertilizer was determined. The overall effect of the fertilization was a decrease in sulfur content of all the treated trees. However, the results were diverse and it is likely that they were influenced by location. The analytical method used to determine the sulfur content of the needles is described.

10207

Utagawa, Tatsuo

EFFECTS OF ENVIRONMENTAL POLLUTIONS ON BIRDS AND ANIMALS.

(Kogai ni yoru choju no eikyo). Text in Japanese. Kogai to Taisaku (J. Pollution Control), (1):35-39, Jan. 1971.

The lives of wild birds and beasts are being threatened because of the destruction of their habitats, as development of those areas progress, and because of pollution from chemical matter, especially from insecticides and herbicides. It is possible that such birds as the albatross, and others, may be accumulating radioactivity. Even in a vast area of the USSR, many wild birds and beasts are dying because of dichloro-diphenyl-trichloro-ethane (DDT). There are only two storks in Japan, since they started to lay eggs which did not hatch because of mercury poisoning. Benzene hexachloride (BHC) and DDT have the same effect on eggs of birds. In the natural habitat of herons near Tokyo one can now see only 2000 herons, although at one time there were 50,000. While the adult herons have to fly increasingly further distances to seek food, the chicks are suffering from swollen knee joints, due to accumulation of chlorine or organic phosphorous chemicals. Swallows are dying, also, because they eat insects on which insecticides were sprayed. The same fate has overtaken crows and kites, as well as herons. Even though DDT and BHC are now forbidden, other chemicals, used for agricultural purposes are poisoning birds. Water fowl are being affected by waste oil and detergents. Foxes, weasels, and martens, the natural enemies

of wild rabbits, died because they ate rats which were poisoned with rat poison. People engaged in the forestry industry are careful of using chemicals which might cause this sort of secondary damage, but the people in agriculture still use these kinds of chemicals. In Japan, BHC and DDT are controlled, but are entirely forbidden, as in the case of the U. S. Monkeys are being starved because of herbicides. There have been cases of cattle and horses which died because of herbicides. Deer and antelopes are also being threatened. The citizens of Ichikawa City succeeded in getting the Chiba Prefectural Government to spend approximately 2,800,000 to make an artificial island to offer a haven for migratory birds. The wild life in the forests of Mt. Fuji is being rapidly destroyed because of a newly constructed road which takes the sightseers to the middle slope of the mountain. It is emphasized that private citizens can cooperate by planting even one tree in their gardens.

EFFECTS-MATERIALS

10208

Lyle, Dorothy Siegert

FUME FADING.

National Inst. of Drycleaning, Silver Spring, Md., Bull-FF-141, 2p., June 1966.

Typical color changes produced in dyed fabrics by combustion fumes and atmospheric contaminants, nitrogen oxides in particular, are noted. Although the discoloration may not become apparent until after drycleaning, it is related not to chemicals used in drycleaning but to the chemistry of the fiber and the dyestuffs used in the fabric. Of the methods developed by textile manufacturers to overcome this problem, the most satisfactory are the use of fugitive or substantive inhibitors. The former, e.g., triethanolamine or melamine, are applied in the finishing treatment; the latter, e.g., diphenylethylenediamine, are applied during the dyeing process.

10209

Seibert, Charles A.

ATMOSPHERIC (GAS) FADING OF COLORED CELLULOSE ACETATE.

Am. Dyestuff Repr., vol. 29:363-374, July 22, 1940. 2 refs. (Presented at New York Section American Association of Textile Chemists and Colorists, May 24, 1940.)

A study made on samples of acetate satin colored with two very sensitive dyes and exposed to heat, automobile exhaust gases, dry sulfur dioxide gas, and refrigerant gas, showed that samples exposed only to heat had one-tenth the degree of color change of those exposed in a test apparatus with the burner consuming 2 cu ft gas per hour and with temperature within the area of exposure between 100 F and 110 F. Various inhibitors to control atmospheric fading have been used to treat fabrics during dyehouse processing. However, laundering, dry cleaning, and perspiration void the effectiveness of these inhibitors to varying extents. Some of the inhibitors affect the shades as well as reduce the light fastness of some or all the dyes used for this group of experiments. Standardization of test apparatus is needed to make various tests comparable. Photographic slides and specifications of test apparatus used are given. Experiments to determine the influence of moisture or humidity on the rate of color destruction were not successful. Work is under way to determine whether a range of blue colored standards can be made by

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APTIC NO. 27698

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combining a sensitive and non-sensitive blue dye in different proportions. As a result of all the experiments, the following methods were recommended: use of dyes most resistant to atmospheric fading, use of inhibitors where valuable, dry clean rather than wash acetate fiber fabrics, and develop inhibitors that can be sprayed or applied in gaseous form similar to present procedure for moth resistance. Discussion of the paper by those present at the meeting centered on unsatisfactory aspects of present inhibitors and on the urgency of the problem because of consumer dissatisfaction.

10210

APTIC NO. 27737

Skowronski, Jerzy I. and Zbigniew Pohl

NEW CONCEPTION OF OUTDOOR INSULATOR FOR THE USE IN AREAS WITH INDUSTRIAL POLLUTION.

(Nowa koncepcja izolatora napowietrznego do pracy w warunkach zabrudzenia pyłami przemysłowymi). Text in Polish. *Przegl. Elektrotech.*, 42(8):257-260, July 1966. 10 refs.

The protective means against industrial pollution leading to breakdown of outdoor high voltage insulators are surveyed. The mechanism of jump-spark and of complete discharge caused by pollution insulators are described. Constructional elements of insulators used so far, however, do not fulfill requirements following from this mechanism. The analysis of formation, and development of wandering arcs leads to a new concept of the insulator surface. The new elements of insulator construction are steps on the surface of insulator discs and sharp ribs (edges) on its body. These enable uniform distribution of voltage along the flow and thus prevents discharge. Furthermore, interruption of discharge on sharp ribs prevents formation of longitudinal arcs and plus leads to greater resistivity against jump-spark offer pollution. Results of testing a new model of insulator and comparison with old models were satisfactory and confirmed that wandering arcs are limited to small areas and interrupted at the edges of the insulator.

10211

APTIC NO. 27739

Berukshitis, G. K. and B. G. Klark

ATMOSPHERIC CORROSION OF STEEL, ZINC, CADMIUM, COPPER, AND ALUMINUM IN DIFFERENT COASTAL AND CONTINENTAL REGIONS.

In: *Corrosion of Metals and Alloys*, Collection No. 2, N. D. Tomashov and E. N. Mirolyubov (eds.) 1963 (?). 9 refs. Translated from Russian by Ch. Nisenbaum, Israel Program for Scientific Translations, Jerusalem, p. 281-297, 1966.

NTIS: TT67-51398

The influence of meteorological conditions, contamination of the air, and the products of corrosion formed, on the rate of atmospheric corrosion of metals in industrial, rural, and coastal regions of the USSR is investigated. The climates in the regions in which the tests were carried out differ greatly. The mean annual temperature varies from 1.6 C in the Northern coastal region to 15 C in Batumi. The mean annual relative humidity varies considerably less (from 69% in Moscow to 82% in Zvenigorod). The duration of wetting of the metal by atmospheric precipitations varies from 1342 hr/year in Moscow to 3161 hr/year in Batumi. The variation in the number of hours of sunshine in these regions is about 2-fold, in the velocity of the wind 5-fold, and in the contamination by sulfur dioxide and salts of sea water 20-40-fold. The results of corrosion tests showed that depending on the variation in the climatological conditions the rate of corrosion of steel and zinc in the above regions varies 2-3-fold; of copper, 4-fold; of cad-

mium, 5-fold; and of aluminum, 72-fold. The rate of corrosion of metals is lower in testing boxes than in the open atmosphere. For steel, the rate in the boxes is (25%) of that in the open atmosphere, and for zinc, copper, and cadmium the factor is 33.67%. The rates of corrosion of aluminum in the open atmosphere and in the testing boxes are the same in all climatological regions. It is possible to make scientifically based calculations on the rate of corrosion of metals in the open atmosphere on the basis of the meteorological factors and the contamination of the atmosphere, taking into account the conditions of testing, the nature of the metal, and the physicochemical properties of the products of corrosion. The data obtained can be used by designers for determining the necessary protective deposits which must be plated on instruments and installations. The results of this investigation should be used for the development of methods of accelerated corrosion tests, and for the determination of coefficients which would convert the data of these tests into those applicable to service conditions. (Author summary modified)

EFFECTS-ECONOMIC

10212

APTIC NO. 27723

McNally Pittsburg Manufacturing Corp.

A STUDY ON DESIGN AND COST ANALYSIS OF A PROTOTYPE COAL CLEANING PLANT.

NAPCA Contract PH 22-68-59, 172p., 1969. 27 refs.

NTIS: PB 196631

Washability studies were conducted to rank coals according to the theoretical recovery of clean coal, total sulfur in clean coal, and size of coal cleaned. Based on the results, a 50 TPH prototype plant was designed to process a wide variety of coals from which to produce satisfactory clean coals with acceptable sulfur content. Operation of the plant will make it possible to demonstrate in actual practice the percentage of reduction of total sulfur and pyritic sulfur for a given recovery of washed coal from a raw coal and the percentage of recovery of pyrite from the washery refuse for various coals. Other objectives of the program are to select a suitable process as well as items of equipment for maximum recovery of washed coal at a given sulfur level and to evaluate the cost of washing in a commercial-size operation for each coal process. Plant design is described together with details of the planned sampling and testing program. Capital and three-year operating costs for the plant are estimated.

10213

APTIC NO. 27724

McNally Pittsburg Manufacturing Corp.

SUPPLEMENT TO 'A STUDY ON DESIGN AND COST ANALYSIS OF A PROTOTYPE COAL CLEANING PLANT.' NAPCA Contract PH 22-68-59, 11p., 1969.

NTIS: PB 196634

A 50 TPH prototype coal-cleaning plant was designed to study the percentage of sulfur reduction for a given recovery of washed coal for various types of coal and the percentage of pyrite recovery from washery refuse. A description of the plant and estimated cost are given in NTIS: PB 196631, together with four alternate methods. In this report, the four alternates are explained in detail and their costs are evaluated. The methods are construction of a full-scale commercial plant (e.g., 1000 TPH), use of existing central testing laboratories, use of coal-cleaning plants strategically located in relation to sources of coals to be tested, and use of current beneficiation

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equipment to predict ash, moisture and sulfur levels in washed coal. Of the five methods, the last alternate is the most economical way of determining reduction of sulfur from a given raw coal.

10214

APTIC NO. 27742

Wolozin, Harold

THE ECONOMICS OF AIR POLLUTION: CENTRAL PROBLEMS.

Law Contemp. Probl., 33(2):227-238, Spring 1968. 15 refs.

The economics of air pollution is largely directed to two broad areas, both difficult assignments: (1) measuring the costs to individuals and society at large of the diffusive despoiling of the atmosphere (and of the corresponding benefits of cleaning it up) and (2) determining economic measures to stimulate and/or coerce polluters to reduce their emissions of destructive gases and particulate matter. Because the state-of-the-art in both areas is still primitive, current estimates of total damage by air pollution are totally unreliable. Moreover, the prognosis for more acceptable estimates is poor since the relation between the level of pollution and the costs of control is very likely nonlinear. A more workable approach might be to recognize that air pollution is one of several severe sources of an accelerated deterioration in the quality of the environment. The need for simultaneous solutions could result in certain savings, such as the lowering in air pollution from expenditures on mass transportation utilizing electricity. There is no clear consensus on what kinds of economic measures should be taken to control pollution. The solution may lie between two extremes: sole reliance on the market mechanism with schemes of effluent fees and complete reliance on government fiat with or without subsidies.

10215

APTIC NO. 27804

Kohn, Robert E.

CAPITAL INTENSIVENESS OF AIR POLLUTION CONTROL.

Preprint, Air Pollution Control Assoc., Pittsburgh, Pa., 19p., 1970. 14 refs. (Presented at the Air Pollution Control Association Annual Meeting, 63rd, St. Louis, Mo., June 14-18, 1970, Paper 70-137.)

The results of a linear programming model for air pollution control in the St. Louis airshed indicate that the least cost solution is capital intensive. It is estimated that \$190 million in capital equipment will be required to achieve a specific set of annual air quality goals for the airshed in 1975. Certain limitations in the model, such as the lack of constraints or shadow costs on solid and liquid wastes resulting from air pollution abatement make this estimate tentative. The largest component of the annual cost of abatement in 1975 is the opportunity cost of capital. This cost, which is based on the internal rate of return for private investment, may have been understated in the model due to a downward correction for private risk. Projections indicate that the required overall collection efficiencies of the five pollutants included in the model will be substantially higher in 1985 than in 1975. Because of the long-lasting nature of capital commitments, a dynamic programming model, which incorporates abatement requirements over a decade or more, may indicate a different solution than the static model. (Author abstract modified)

10217

APTIC NO. 27809

10216

Gressingh, L. E., A. F. Graefe, F. E. Miller, and H. Barber

APPLICABILITY OF AQUEOUS SOLUTIONS TO THE REMOVAL OF SO₂ FROM FLUE GASES, FINAL REPORT. VOL. 1.

Aerojet-General Corp., El Monte, Calif., Air Pollution Control Dept., Contract PH 86-68-77, 478p., Oct. 1970. 689 refs. NTIS: PB 196780

A review of the literature revealed approximately 500 technical documents relating directly or indirectly to the aqueous scrubbing of sulfur dioxide from flue gases. Some 30 processes were identified, and of these, sufficient data were available for a preliminary economic evaluation of 22. As a result of this evaluation, the following four processes were selected for demonstration and/or improvement and economic analysis: zinc oxide (sodium sulfite scrubbing); Cominco exorption (ammonium sulfite scrubbing); ammonia-hydrazine exorption (hydrazine scrubbing) and Mitsubishi lime (lime water scrubbing). The data obtained show that the Cominco exorption and ammonia-hydrazine exorption processes are not economically feasible and that the Mitsubishi process is feasible only if there is an appreciable market for the by-product gypsum. The zinc oxide process may be economically sound under certain favorable marketing conditions when the SO₂ is converted and sold as concentrated sulfuric acid. Cost estimates for this process were completed for a large new and existing power plants, a small existing power plant, and for an existing smelter facility. No improvement in the original process was effected, but the investigation of this process led to the conception of a new process in which a fluidized bed of zinc oxide is used directly for the low temperature (50 C) sorption of SO₂. The feasibility of the concept was demonstrated in the laboratory.

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APTIC NO. 22136

Sato, Eisaku, Y. Nakasone, E. Shiina, and T. Sonoda

ORDINANCE TO ENFORCE THE AIR POLLUTION CONTROL LAW.

(*Taikiosen boshiho shikorei*). Text in Japanese. Government Ordinance 329, 19p., Nov. 30, 1968.

Ordinance No. 329 was established to enforce the Air Pollution Control Law. Emission sources of smoke and air pollution to which the law is applicable are tabulated, ranging from boilers to incinerators, and the legally applicable sizes and characteristics of each are specified. The 24 substances considered harmful are listed, and include ammonia, hydrogen fluoride, hydrogen cyanide, and formaldehydes. Carbon monoxide from automobile exhaust gas is also specified under a separate category as an air pollutant. The procedures for mediating disputes over air pollution are also listed, while the 'appointed areas' to which the Air Pollution Control Law is applicable are enumerated in detail. They include all or part of Yokohama, Kawasaki, Niigata, Nagoya, Osaka, Sakai, Kobe, Himeji, Amagasaki, Kita-Kyushu, and Omuta.

10218

10218

APTIC NO. 22419

Pikler, Ferenc

COUNTRY-WIDE EFFORTS TO PROTECT THE CLEAN-
NESS OF AIR.

(Országos erőfeszítések a levegő tisztaságának megóvása érdekében. Text in Hungarian. *Energia Atomtech.* (Budapest), 23(5):200n202, May 1970.

The quality of the air in Budapest and other Hungarian cities deteriorated recently, a phenomenon similar to developments abroad. The Hungarian situation, however, is worse than the corresponding foreign state of affairs, especially during the winter months. Remedial work started more than 15 years ago, in the Aerosol Division of the Scientific Association for Power Supply. This voluntary work eventually led to official recognition; e.g., in Budapest, the City Council issued an Air Cleanliness Ordinance in 1962, at the initiative of the Association. By 1968, the anti-air-pollution activity became a national task and was placed under the auspices of the Minister for Construction and City Development. This Government agency is empowered to issue ordinances but it is next to impossible to carry out the ordinances: the control organs have neither personnel nor expertise. Even newly installed air cleaners and precipitators are bypassed or, in case of a malfunction, they are not repaired. Therefore, the first task is to persuade the public to help the enforcement of the laws already on the books. Next, the use of offensive energy carriers has to be made prohibitively expensive. Then national norms of emission will have to be established and the timetable of power generation will be worked out in accordance with the requirements of climatology. In general, the public has to realize, that air is a commodity in very short supply. The substitution of gas and oil to replace coal is inevitable. The press, radio and TV will have to be actively used.

10219

APTIC NO. 25502

Rahlenbeck, Ursula and Walter Seidl

INFORMATION RETRIEVAL IN THE FIELD OF AIR
POLLUTION CONTROL BY THE PERMUFAC-INDEX.

Preprint, *International Union of Air Pollution Prevention Associations*, 44p., 1970. (Presented at the *International Clean Air Congress*, 2nd, Washington, D. C., Dec. 6-11 1970, Paper AD-36D.)

Due to the explosive development of literature within the field of air pollution and the rising difficulties of recording the literature published in an increasing number of countries and languages, documentation as an information source gains increasing importance. The efficiency of an information retrieval system depends on the suitability of the chosen classification rather than on the storage medium. Subject indexes are especially suited for demonstration of classification systems: they are clear and everybody is well acquainted with them. The most attractive design of such an index in the field of air pollution control is the Decennial Subject Index of the APCA Abstracts. With regard to some thousand documents, however, it is only of limited value. Improvement and consistent application of the initial concept resulted in the development of the Permufac-Index, the permuted faceted graded subject matter index. A conceptual analysis of documents with the aid of this index requires a careful characterization of the results and conclusions of each paper by standardized subject matter, that is indexing terms logically connected by prepositions. Examples of the indexing relationships are discussed. On the basis of comprehensive analyses about 80 schemes of subject matter relevant for documents on air pollution control have been

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determined. These complete basic forms have been supplemented by about 370 abridged forms consisting of fewer descriptors than the complete form and moreover by about 800 permutations. The indexer sifts the material, selects the suitable standardized form for the subject matter of the document and completes it by an annotation of his own opinion. The standardized form together with the annotation is punched into punch-tapes. In cooperation with the Siemens AG a method of programming data processing equipment has been developed for automatic permutation of the basic forms, elimination of repetitions, and alphabetical arrangement. Finally a short review on the new abstract journal VDI-Reinhaltung der Luft-Selecta is given for which the Permufac-Index has been developed.

10220

APTIC NO. 25542

Haar, Ulrich de

THE MONITORING STATION PROJECT 'KEEPING THE
AIR CLEAN'.

(Das Messtellen Projekt 'Reinhaltung der Luft'). Text in German. *Umschau* (Berlin), 70(23):746-774, Nov. 5, 1970. 3 refs.

The carbon dioxide content in the atmosphere has increased by 16% since the beginning of the century and is expected to double in the first half of the next century. While CO₂ does not absorb sunlight, it does absorb night-time long-wave radiation with a resulting increase in atmospheric energy. Increased emission of sulfur dioxide reduced the pH of natural precipitation in the Schwarzwald in Germany from 4.9 in 1965 to 4.5 in 1970 with a resulting decrease of pH in surface waters possessing only a limited buffering capacity and a shift in the hydrobiological equilibrium. It is not enough to measure pollution in highly industrialized areas; pollution spreading to so-called clean air is more dangerous in the long run. For this reason, a network of measuring stations has been established over the Federal German Republic whose objectives are the recording of slow atmospheric changes, the gathering of comparative data for epidemiological studies of population groups from highly polluted areas, and the study of long-term chronic effects of low levels of pollution on humans, plant life, animals, and materials. The data sought include pH, conductivity, dust concentration, soluble and insoluble dust precipitation, chlorine, ammonia, sulfates, CO₂, SO_x, NO₂, F, radioactivity, pollen and spore count, lead level, residual levels of cancerogenic substances and pesticides, N₂O, ozone, particle count, SO₂ and aerosol spectra, iodine level, heavy metals and terpenes, and the usual meteorological parameters. It is hoped that a similar network will be established all over Europe.

10221

APTIC NO. 27721

PROFILE STUDY OF AIR POLLUTION CONTROL AC-
TIVITIES IN FOREIGN COUNTRIES. FIRST-YEAR
REPORT.

Esso Research and Engineering Co., Linden, N. J., Government Research Lab., Contract CPA 22-69-68, Rept. APTD-0601, 816p., Nov. 1970.

NTIS PB 196841

A synopsis of air pollution control activities is presented for Austria, Belgium, Denmark, France, Germany, Great Britain, Italy, Japan, Netherlands, Norway, Sweden, Switzerland, and the Soviet Union. For each country the profile includes a discussion of geography, political features, current air pollution controls, and future trends, followed by an outline of the relationships among major organizations active in air pollution control. Regional European intergovernmental organizations

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with programs relating to the environment are also indicated. A photographic reproduction of a set of index cards are presented for individual air pollution related organizations in each of the countries covered by the profile texts. These cards were initially prepared as work sheets for compiling the background material for the profiles, but later proved useful for condensing the information gathered during interviews with the respective organizations.

10222

APTIC NO. 27761

Roberts, J. J. and E. J. Croke

LAND USE AS AN ORGANIZATIONAL BASIS FOR URBAN AND REGIONAL AIR RESOURCE MANAGEMENT.

Preprint, Air Pollution Control Assoc., Pittsburgh, Pa., 23p., 1970. 8 refs. (Presented at the Air Pollution Control Association, Annual Meeting, 63rd, St. Louis, Mo., June 14-18, 1970, Paper 70-140.)

An approach to the development of implementation plans for stationary sources of sulfur dioxide and particulates based on the integration of air resource management with urban and regional planning is described. This was achieved through the use of an atmospheric dispersion model to establish well-defined emission rights associated with each parcel of land in the region. Within the context of the system, all of the usual control techniques, such as emission control devices, fuel switching and stack height ordinances, and all of the usual administrative and enforcement procedures such as permit systems, inspections, and emission inventories can be applied. The term air resource takes on real meaning if emission rights are attached to land use. In this situation, a regional airshed is as legitimate a physical, economic and political reality as a regional watershed and can be managed in the same way. The methodology insures that the desired long-range regional air quality goals are attained by implementation plans which have an inherent economic optimality, yet which are not sensitive to detailed inputs required in a cost-effectiveness analysis. (Author abstract modified)

10223

APTIC NO. 27810

Strang, William J. and Walter G. Popiel

THE DEVELOPMENT OF ALLEGHENY COUNTY'S BUREAU OF AIR POLLUTION CONTROL ON-LINE COMPUTER DATA PROCESSING SYSTEM.

Preprint, Air Pollution Control Assoc., Pittsburgh, Pa., 31p., 1970. 2 refs. (Presented at the Air Pollution Control Association, Annual Meeting, 63rd, St. Louis, Mo., June 14-18, 1970, Paper 70-58.)

The development of an on-line air pollution telemetered data processing system is described. A manual sampling program consists of collecting and analyzing data from 61 stations located primarily in the river valleys on relatively close proximity to commercial and industrial sources of pollution. Routines are performed to determine levels of dust fall, sulfation rate, sulfur dioxide, hydrogen sulfide, pollen, and radiation. The first 2 remote automatic continuous air quality monitoring stations were established in 1967 to monitor air contaminants in Allegheny County and to telemeter data to a central receiving station. The sensors are described. The physical preparation and training of personnel are also discussed. The central processing unit has the capacity to receive and process data from 17 remote stations containing approximately 103 sensors. Computer specifications are given. The advantage of the telemetry of the system gives the operator two-way communication, that is, the ability to instruct the remote sensor to send

sampling signals, zero readings of the instruments, or calibrations.

10224

APTIC NO. 27815

Drucker, Marjorie A.

AIR POLLUTION CONTROL ADMINISTRATION: PAST, PRESENT, AND FUTURE.

Preprint, Air Pollution Control Assoc., Pittsburgh, Pa., 16p., 1970. 9 refs. (Presented at the Air Pollution Control Association Annual Meeting, 63rd, St. Louis, Mo., June 14-18, 1970, Paper 70-87.)

The underlying administrative strategies of air pollution control programs are summarized prior to enactment of the Clean Air Act as amended in 1967. Their limitations are cited, and critical problems currently facing administrators implementing the Clean Air Act as amended are identified. In the past, three fundamental strategies of air pollution control have been utilized, either singularly or in various combinations: setting quantitative limitations on emissions, establishing quantitative limitations on ambient air quality, and prohibiting altogether the existence of 'air pollution'. With the enactment of the Clean Air Act as amended, both air quality standards and emission standards will be utilized. Now, administrators of local, state, and federally designated Air Quality Control Regions, may not only encounter the limitations and problems inherent to these strategies, but may also face the concomitant problems related to regionalization, such as differing economic and social interest, financial support, and enforcement. Air pollution control programs should integrate past approaches to control in such a manner as to maximize the advantage of each strategy in relation to the specific characteristics and needs of an area. Long-range planning is imperative. (Author abstract modified)

10225

APTIC NO. 27825

Purdom, P. W.

PRINCIPAL FEATURES IN PHILADELPHIA'S AIR MANAGEMENT CODE.

Preprint Air Pollution Control Assoc., Pittsburgh, Pa., 10p., 1970. (Presented at the Air Pollution Control Association Annual Meeting, 63rd, St. Louis, Mo., June 14-18, 1970, Paper 70-91.)

Philadelphia's new pollution code was developed with a view to long term air management. Such an approach envisions the regulation of land use. However, the problem was one of how to provide for a transition from a basically nuisance abatement approach to one of air management to achieve specific air quality objectives. The basic tool to prevent air pollution under the new code is the power of the Air Pollution Control Board to adopt regulations which limit the emissions of air contaminants. To assure that emission standards are met, a permit is required for new installations and major modifications. An operating license is conditional upon meeting requirements, and existing installation have two years to obtain a license. Annual renewal of licenses requires an inspection and approval by the Air Management Services. Implementation of the community air quality objectives and regulations requires an extensive air monitoring network and correlation of data obtained with meteorological, topographical, and emission data. Administrative and enforcement provisions are mentioned, as well as the supporting facilities and quality of the personnel.

10226

10226

Haagen-Smit, A. J.

THE RAVAGED ENVIRONMENT. IV: AIR POLLUTION: THE ENVELOPING SHROUD.

Consulting Eng., 36(3):112-117, March 1971.

Air pollution caused by smoke and oxidizing, smog-producing pollution are described. The haze so prevalent in large cities is noted to be an ominous sign that control technology alone is not able to cope with the growth in population and its polluting activities. What is needed is a multifaceted approach and participation by every profession that can make a contribution. Biologists, for example, can determine the threshold levels of tolerance for the thousands of new synthetics that float in air and pervade food. The engineer can develop totally new concepts for the capture of gases and particulates. Plans of action should include the conservation of green areas, development of a satisfactory transportation system, and the management of the industrial complex with an overriding regard for its effect on the environment. Consideration should be given to moving polluting industries to better ventilated areas and to the total conversion of certain regions to electric power.

10227

Middleton, John T.

AIR CONSERVATION: MEETING THE CHALLENGE.

J. Air Pollution Control Assoc., 21(2):60-61, Feb. 1971.

Scientists and technicians, in their need to define segments of the problem precisely, have failed to attend to the need for global and political movements to deal broadly with air pollution and the related issues of energy policies, transportation systems, and land use. Through the cooperative efforts of the members of the International Union of Air Prevention Association, it may be possible to not only upgrade process efficiencies and control technology, but to design and enforce the sound national legislation required to conserve air resources.

10228

Tokyo Metropolitan Government (Japan), Bureau of Capital City Development

OUTLINE OF THE RULE ON THE TENTATIVE ENFORCEMENT OF URGENT MEASURES TO BE TAKEN AT THE TIME OF PHOTOCHEMICAL SMOG.

(Tokyo kagaku sumoggu kinkyuji taisaku zantei jissi yoko). Text in Japanese. 28p. July, 1970.

Oxidant concentration is measured by automatic recorders (iodine potash method) at 4 points in Tokyo (standard measurement points) by the Tokyo Metropolitan Government Public Hazards Research Institute, and the result is relayed to the Public Hazards Control Department, Metropolitan Area Improvement and Consolidation Bureau, Tokyo Metropolitan Government. Meteorological data are obtained from the Tokyo Regional Observatory and Tokyo Metropolitan Air Pollution Check Points. Critical situations are judged by the following standards: First stage (photochemical smog alert), hourly average oxidant concentration at standards check points above 0.15 ppm and likely to remain so because of meteorological condition (less than 3 m/sec wind velocity, fine weather); Second stage (photochemical smog warning), the concentration exceeds 0.30 ppm and it is seen to continue because of meteorological condition (less than 3 m sec wind velocity, fine weather). When the concentration decreases to 0.10, the warning and alert are lifted by the director of the Bureau of Tokyo Metropolitan Area Improvement and Consolidation, who also issues the alert and warning. In emergencies, wards, cities and

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towns concerned, various agencies of the Metropolitan Government, public health centers, metropolitan police, fire brigade, and others were asked to extend their cooperation as well as factories and enterprises (whose names, addresses, telephone numbers are listed). Emergency measures include restrictions on automobile travel, curtailment of outdoor activity, and curbs on smoke emission. This warning system has been in effect since July 27, 1970. Permanent regulations will be established after the fact-finding surveys, and additional research.

SOCIAL ASPECTS

10229

Kaigisho, Tokyo Shoko

PUBLIC NUISANCE - PRESENT STATUS AND COUNTERMEASURES IN THE INDUSTRIAL AREAS OF JOTO AND JONAN.

(Kogai - Joto Jonan chiku koje chitai no genjo to taisaku). Text in Japanese. Tokyo Chamber of Commerce and Industry, 101p., March 30, 1970.

This report is based on the reply to a questionnaire sent out to 1271 factories between Aug. 1 and Sept. 15, 1969. Half of the factories had received complaints on public nuisance, among which noise was predominant, followed by dust and smoke, vibration, offensive odor, exhaust gas, and contaminated water. Of the total consumption of crude oil, 17% was the low-sulfur type. Industrial waste disposal was a problem for 16.8% of the factories, while another three-quarters of the factories solved the problem by direct negotiation with the suffered party and subsequent emergency countermeasures. Several factories spent more than 10% of the total sales for the countermeasures; more than half paid the expenses out of their own capital, and almost as many more made up the cost by an increase in production and sale. Most of the companies realized the seriousness of the public nuisance, but medium and small-scale ones could not take necessary countermeasures because of financial problems. Each case of the public nuisance is listed together with countermeasures taken.

10230

Anastaplo, George, R. Stephen Berry, Ronald H. Coase, Harold Demsetz, and Milton Friedman

THE LEGAL AND ECONOMIC ASPECTS OF POLLUTION.

Chicago, Chicago Univ. Center for Policy Study, 1970, 34p.

An all-faculty panel representing liberal arts, law, science, business, and economics discuss the basic philosophic problems underlying current attitudes toward pollution. Among the critical questions central to their debate were: What are our realistic goals? Who pays the social and economic costs of their implementation? Should these costs take precedence over economic and social welfare programs? What authority should enforce antipollution regulations? The adage 'you don't get something for nothing' was demonstrated to be as relevant to the growing and necessary debate over environmental pollution as to any other major issue facing the country. The real problem is not zero pollution, but what amount of pollution.

GENERAL

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10231

APTIC NO. 23309

Bryson, Reid A. and John E. Kutzbach
AIR POLLUTION.

Washington, D. C., Association of American Geographers,
Commission on College Geography, 1968, 42p. 61 refs.

A brief review of air pollution, its causes, effects, extent, and potential are documented in this college-level geography course supplement. Man and his society are called the polluters. By his very number, man cannot help but create pollution, and the technology upon which his society is based contributes to the problem. The role of the city in concentrating pollution is described. Air pollution episodes in Donora, Pa. and London, England are documented as to the incidence of

air-pollution related deaths by age group and increases in respiratory diseases during and following the episodes. The striking difference between urban and rural morbidity of respiratory disease is pointed out and attributed, in part, to the cities' concentration of air pollution. Micrometeorological variations produced by cities are mentioned with specific, quantitative examples given for cloudiness, fog, and precipitation. The part played by industry, agriculture, and the automobile are made a part of the over-all problem. The interaction among industrially generated sulfur dioxide, vehicular hydrocarbons and oxides of nitrogen, ozone, and solar radiation is discussed as the source of secondary pollutants, respiratory system and eye irritation, and damage to vegetation. The global affects in terms of the overall change in the chemical composition of the hydrosphere, temperature change, and possible biogenetic mutilation are also discussed.

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1969 DATA TABULATIONS AND SUMMARIES. CONTINUOUS AIR MONITORING PROJECTS. NATIONAL AIR SURVEILLANCE NETWORKS. CHICAGO.

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